AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

VOL. 5, No. 51. WEEKLY. | NEW YORK, DECEMBER 23, 1882. | $3.00 per Annum. SINGLE COPIES, 6 CENTS.

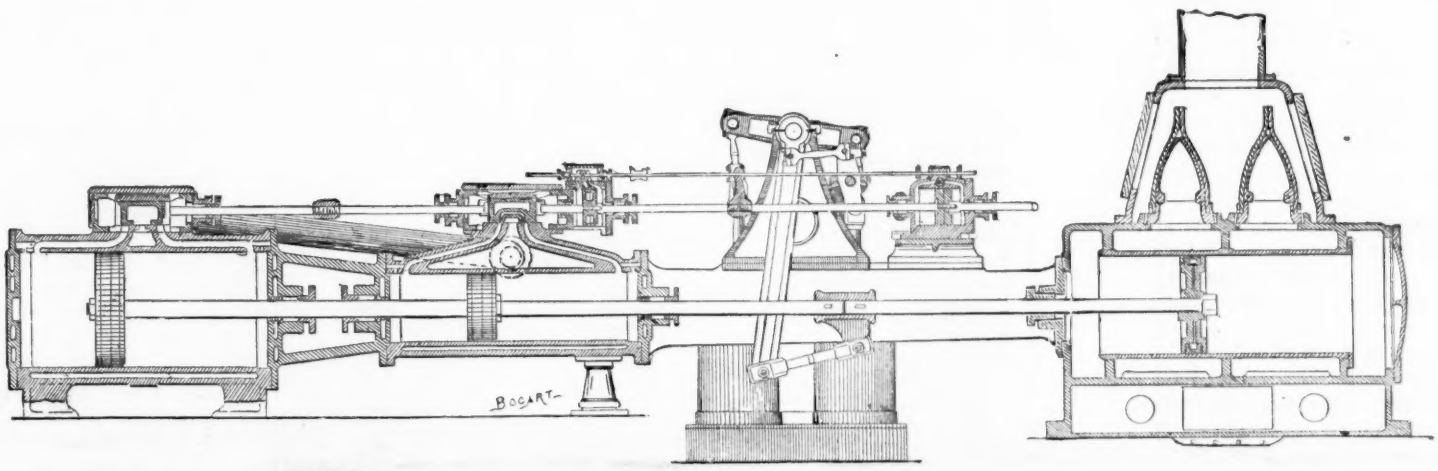
COPYRIGHT, 1882, BY AMERICAN MACHINIST PUBLISHING COMPANY.

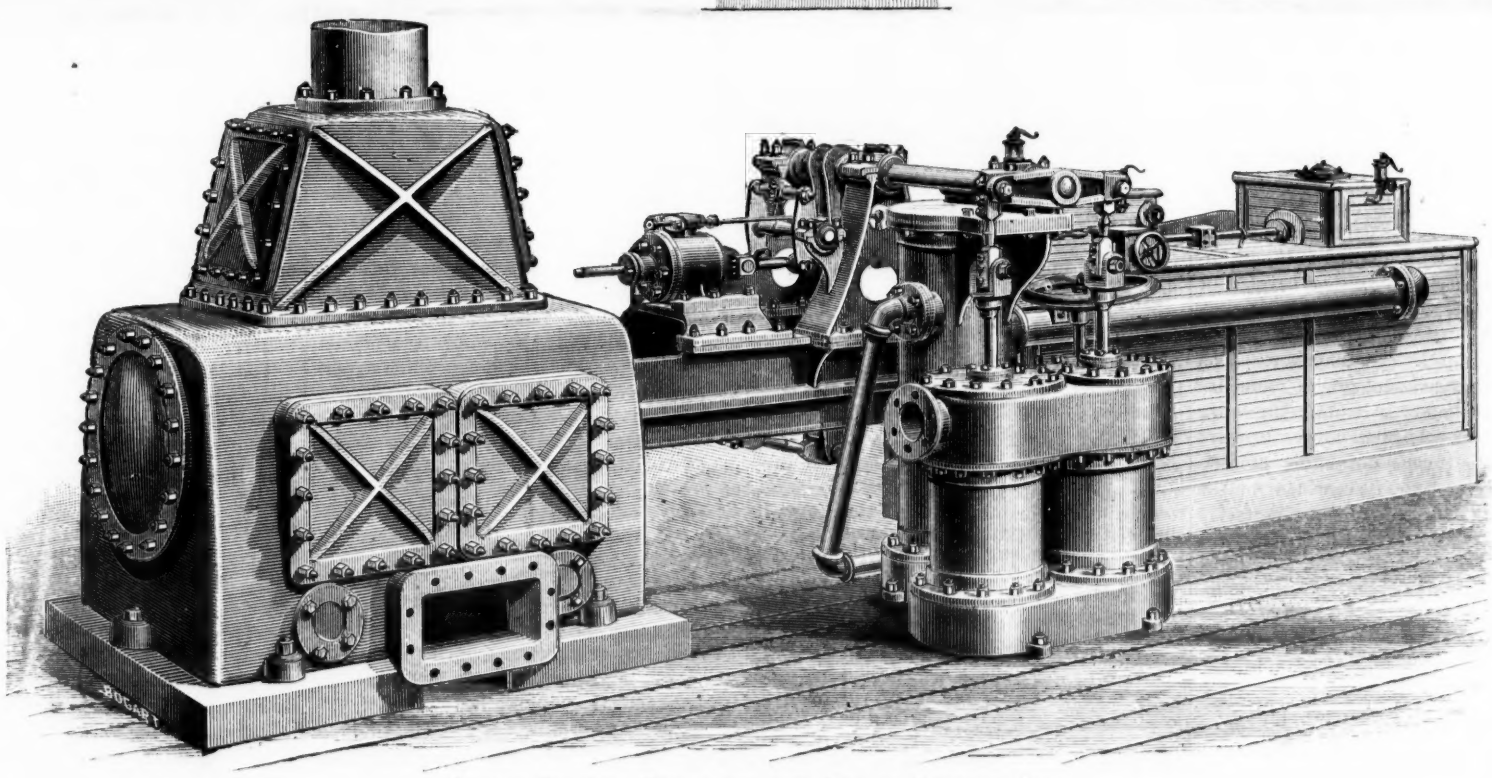
For Sale Everywhere by Newsdealers.

ENTERED AT POST OFFICE, NEW YORK, AS SECOND CLASS MATTER.

Improved Sewage Pumping Engine.

The accompanying illustrations represent, in elevation and section, one of the pair of pumping engines for the city of Pullman, Cook Co., Ill. These engines have each a capacity of 2,500,000 gallons in 24 hours, and are designed to take the sewage from a large central reservoir or basin underneath the pumps, or in the basement of the large tower that supports the main water-tank, and deliver it through 3 miles of 20″ cast iron pipe, leading to the farm (15,000 acres) of the Pullman Co., where it is distributed as required. The engines are of the direct acting, tandem compound condensing type, having piston pumps with phosphor bronze cylinders, fitted with valves especially designed for passing everything usually found in sewage.





SEWAGE PUMPING ENGINE FOR THE CITY OF PULLMAN, ILL.

The steam cylinders are fitted with the "isochronal" or self-regulating valve gear, which, in operation, controls the speed under any variation in pressure or load, as in the case of the reservoir becoming exhausted, or the bursting of the main sewage pipes. A detailed description of this valve gear appeared in the AMERICAN MACHINIST of June 28, 1879. Its operation is so satisfactory that it relieves the engineer of a large part of his duty, his presence, we are told, being required only in stopping and starting, and in attending to the lubrication. The cylinders are steam jacketed, covered with non-conducting material, and enclosed with a neat black-walnut lagging.

The valves of both the main steam pistons are balanced, to provide for easy working and to prevent wear and continued tightness. They are steam moved, as clearly shown in the sectional elevation.

The main steam pistons are arrested at the termination of the stroke by positive steam cushion, which stops them without shock or jar. They are started in their stroke with an easy, gradual movement, this last named action being brought about by the operation of the cataract cylinder, the piston of which displaces the oil in the cylinder at a speed regulated by a graduated opening connecting one end of the cylinder with the other, and hence controls to any desired extent the velocity with which the steam valves can be opened. This is a very important feature where large pump valves are to be opened and closed, particularly where the water is liable to be irregularly supplied, or where the valves are liable to be entangled with obstructions.

The condenser and air pumps are of the usual type, and are operated directly from their respective engine.

The diameter and stroke of engine and pump are as follows: Diameter of high pressure cylinder, 14¾ inches; diameter of low pressure cylinder, 25 inches; diameter of pump cylinder, 22 inches; stroke of all pistons, 4 feet. It will be seen that the ratio between the high and low pressure cylinders is about three to one. The steam pressure carried is 60 pounds. This class of pumping engines, with a specially arranged plunger pump, has been successfully applied to waterworks in other cities. It is built by the Cope & Maxwell Manufacturing Co., Hamilton, Ohio.

½ oz. camphor, one pound of lard, and black lead enough to color, mixed together and applied with a cloth, is said to protect iron work from rusting.

Burning Smoke and Sparks.

The Chicago, Rock Island and Pacific Railroad has adopted a device that does the work. Since the introduction of bituminous coal for fuel in locomotives, nothing has attracted the attention of master mechanics more than has the matter of sparks and smoke, and how to get rid of the nuisance has been a conundrum, and no expense has been spared to reach this much-desired end. The theory that sparks and smoke could not be burned has been exploded, and it is to be hoped, for the sake of the traveling public, that the subject will not be dropped until all the railways in the country have secured to themselves the benefits of complete combustion in their fire-boxes. The device in use on this road is simple in the extreme; no change of fire-box is made, and it is not liable to get out of order, and is based upon purely mathematical principles, it requiring a certain fixed amount of oxygen to complete the combustion of a certain fixed amount of coal. With this device currents of pure oxygen are supplied to the fire in any quantity at the will of the fireman. It would be

useless to add that great economy in fuel has been found, and that the danger from fires has been reduced to the minimum, as these are well-known facts, that smoke and sparks are good fuel, and would have done duty as such before leaving the fire-box had they had an opportunity.—*Railway Age.*

New Screw Slotter and New Cutter Grinder.

One of the accompanying cuts illustrates a very simple device for rapidly slotting screw-heads, designed and manufactured by E. E. Garvin & Co., 139, 141 and 143 Centre street, New York City. The operation of the machine is simple, requiring but a single downward pressure upon the lever, shown in cut, to both grip and slot the screw.

The grip is accomplished by means of a toggle joint, which is the first to act in the downward movement of the lever; when the jaws have closed tightly upon the work, the toggle forms a part of a rigid lever to aid in slotting the screw.

On releasing the lever, the screw-head is clear of the saw before the jaws relax, which they do as the lever is raised to a certain point, dropping the screw out and leaving the jaws ready for another. One jaw being readily adjustable, screws of different diameters can be slotted without the delay of changing any of the parts. The bearings are all provided with take-up for wear. Aside from screw slotting, this arrangement may be used in milling a certain class of light work, where extra speed of manipulation is required

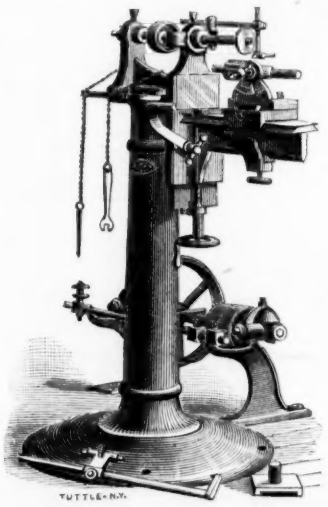
This machine is mounted upon a planed iron table, whose edge forms a groove for catching the oil and chips, entirely around it. Adjustments for position and depth of slot are provided.

The weight, complete, is 250 pounds.

A second cut illustrates the several improvements made upon their cutter grinding machine, by the same firm.

The construction of the machine has been simplified by substituting a planed knee for the heavy stud formerly in use. A sliding platform, which is made to move more freely than that in the old-style machine, is fitted to this knee, and is bound in any desired position by a gib screw with hand wheel. Upon this platform is fitted a stand for the mandrel stud, which has a universal adjustment to any angle, read in degrees from graduated arc. Thus, it is adapted to the grinding of any shape cutters, either beveled or straight face, with plain or spiral flutes. It will take mills from ½″ to 8½″ diameter, and face mills up to 12″ diameter. The parts are so arranged that ample room has been left for the hands in sliding the work upon the mandrel. A shield covers the ways for the sliding platform, thoroughly protecting them from emery. The bearings for the spindle are encased by cap nuts, perfectly excluding the emery and dust. On the floor of the cut is shown a platform for face mills, and a pair of centers for holding solid reamers and other centered work. The countershaft, with tight and loose pulleys, 4½″×2″ face, runs 400 revolutions per minute in self-adjusting and self-oiling boxes. The countershaft hangers are of new and improved pattern.

The machine, complete, weighs about 300 pounds.



NEW CUTTER GRINDER.

NEW SCREW SLOTTER.

The Growth of the Steam Engine.

We clip from the *Evening Bulletin* (Providence) the following extracts from an address delivered by Professor Channing Whittaker, of the Boston Institute of Technology, before the Rhode Island Association of Engineers:

* * * * *

The steam engine became important when it was found to be capable of draining the rich mines of Cornwall and of other districts. These mines were some of them so completely submerged with water that they were scarcely of any value. If the water could be pumped out of them, their owners could make money by the sale of the output. The wealth that resulted from the sale of the output was the cause of the rapid introduction and improvement of steam boilers and of steam pumping machinery, which at that period of history found its most perfect expression in the wonderful inventions of Watt. It was not the inventive genius of Watt and of his predecessors which brought the steam engine into common use. It was the profit which resulted from its employment in the mines of Cornwall, and, wherever steam machinery has been produced with more than usual rapidity, it has been because some special application of steam machinery has been found to result in unusual profit at the time. The present unprecedented activity in the construction of steam machinery results from the profit that attends the production of electricity by the power of steam.

* * * * *

All through the West quick-speed engines are now common, and it is no longer a strange sight to see a circular saw placed directly upon the crank shaft of an engine, and making 250 turns per minute, or to see the plate iron saws, which, in rolling mills, trim iron and steel bars to length, directly connected to a quick-speed engine that turns from 300 ts 500 times per minute. Even in our large manufactories, a similar change is taking place, held in check by conservatism on the part of mill managers and by lack of experience on the part of the designers and runners of quick-speed engines. The purchasers of unusually rapid engines will doubtless have some unsatisfactory experiences, until designers become entirely familiar with the peculiar conditions which attend high speed. But such purchasers will advance both the science and the art of steam engineering. As the quick-speed engine becomes known and improved, it will be found more frequently attached directly to the shafting of manufactories, and this method of connection will gain favor until it has become the common one.

* * * * *

Watt used steam expansively, but he overestimated the advantages that resulted from this practice, because he was not aware that he had not completely suppressed the condensation of steam in the cylinder, and that increased condensation and increased leakage result from increased expansion. The extent of this cylinder condensation and of this valve and piston leakage would have gone undetected for a much longer time than it did, had not the practice of determining the efficiency of an engine by experimentation been substituted for the practice of estimating its efficiency upon the basis of ingenious, but, unfortunately, false hypotheses. Chief Engineer B. F. Isherwood, of the U. S. Navy, led the way in these investigations. Mr. George B. Dixwell, of Boston, is entitled to great credit for having made valuable investigations and discoveries by experimentation, concerning the increase and diminution of cylinder condensation and leakage that occurs under different circumstances, and he has not only devised a simple and efficient instrument—the cylinder pyrometer—by the aid of which steam that has been superheated sufficiently to prevent condensation may be used in an ordinary engine without danger of injuring it; but he has laid the foundation of instruction in steam engineering, through a practical experience, at the Massachusetts Institute of Technology in Boston, Mass.

S. W. Putnam, Fitchburg, Mass., writes us, referring to the letter from Mr. Woodward upon lathes with three leg supports, published in No. 46 of present volume, and encloses a photograph of a neat appearing lathe supported upon three legs, which he informs us he designed five or six years ago, and that quite a number of them have been on the market and in use for that length of time.

The Performance of Locomotives.

The actual data in existence as to the performance of American locomotives are indeed meager, and it is safe to say that no exact figures are at hand. This arises from the very simple fact that systematic efforts to obtain these figures have thus far been very few. The different associations devoted specially to railroad engineering have occupied their time mainly with the establishment of standards, and have not agitated the necessity of determining by test the economy of the various railroad locomotive appliances. It is somewhat surprising that the large railroad companies have not long before this instituted a system of records as to the steam and fuel consumption as compared to the power developed in locomotives, for an enlightened self interest would dictate the introduction of such a system. In the estimates of the economy of the locomotive performance, the usual record of finding the fuel consumed per mile is, however, only of small account. This does not separate nor individualize the many conditions which affect the final economic result. What is needed to determine the steam economy of the locomotive under varying conditions of running is a record of the indicated horse-power developed, and the steam and the fuel consumed per horse-power per hour. Such data enable the engineer to learn whether the boiler or the engine is at fault, and what conditions of running contribute to economy of fuel consumption. A year ago this was earnestly urged at a meeting of the American Society of Mechanical Engineers, and not without effect, if recent indications may be accepted. The danger, however, will be, when experiments are made as to the fuel and steam consumption per horse-power developed per hour, that the same mistake will be repeated that has been made in stationary, pumping and marine practice. The danger we refer to is, that efforts will be made to reduce the steam and fuel consumption, irrespective of the effect of such reduction of expense upon the other items of expense incident to locomotive practice. For instance, a higher ratio of expansion might decrease the fuel consumption per horse-power developed per hour, but if the cylinders and the other parts of the engine would have to be made so much larger to develop the required horse-power, that extra interest, repairs and depreciation would more than compensate the money saving in fuel, it would be unwise to decrease the fuel consumption by an increase of the ratio of expansion used. Of course many practical conditions would prevent the use of high ratios of expansion in locomotive practice, but the principle of danger is nevertheless well illustrated by the example we have chosen. To simplify our point still further: Increase in the high rate of revolution already in vogue in locomotive practice might occasion economy in steam consumption, which experimental trials and record would evidence; but it would only be good practice to increase the rate of revolution, if the extra annual expense from wear and tear would be less than the money saving of fuel. Those who have compared the economical performance of American and English locomotives—that is compared the few data at hand—will recognize that experimental work will certainly lead to a great modification in American locomotive practice, by teaching the real economic value of certain devices and certain conditions of running, and by calling attention to the necessity of certain improvements. The Master Mechanics' Association can engage in no work of greater importance at the present time than agitating the necessity of the obtaining of exact data as to locomotive performance, and to take steps to insure that these data when obtained are given the widest publicity.—*The Railway Review.*

Steam Boilers.

BY N. H. BROWN.

In his address at Providence, reported in AMERICAN MACHINIST of October 28, 1882, Mr. Brayton illustrated "that if heat be applied to the bottom of a vessel of water its contents will be heated alike, but if applied at or near the top it will boil there, while an inch or two below it will remain cold."

These results are probably inevitable and constant, as they come within the operation of the laws of gravity.

Now there are many boilers in use that have a water space around and below the furnace, the water in which cannot be affected by direct heat, and is only heated by such imperfect circulation as may take place.

While these seem wrong in theory, they have as compensation the convenience of confining the fire within safe limits, and they afford a pocket for the deposition of sediment. In fact in some styles of boilers this space is called the "mud drum." Now in the perfect boiler, where the heat is applied to the bottom, all this sediment will be deposited directly above the fire; and right here the point may be made, that however perfect the boiler, pure water is essential to economical practice. This will require, usually, that the water be heated and purified before entering the boiler, and be frequently "blown down" afterwards.

In shell boilers, not fired through the night, this should be done the first thing in the morning, and may be continued until ebullition has slightly disturbed the sediment.

In blowing down the water from boilers having mud drums, some steam pressure may be used, but in all cases the blow-out pipe should connect with the lowest point of boiler, and decline from it.

The long cylindrical boiler of moderate diameter, with two return flues, is simple, of low cost, economical as to fuel and maintenance, affords a large water and steam space, provides a long and clear traverse for the currents of combustion, and the heat can nowhere impinge upon its metal, except where protected by water on the opposite side. It is accessible, internally, for examination, cleaning, or repairs. It promotes circulation, as the water rises in a straight line between the flues, divides, and flows over them down the sides of the boiler to the bottom, to repeat the operation.

I am not in the least comparing this boiler with other kinds, but as it has come down to us, it seems fair that so long as it remains in use, it should have whatever credit may be due, and that we should impress upon it such improvements as science may suggest. As to its defects, its flues are liable to collapse under heavy pressure, and it has been difficult to furnish it with a satisfactory setting. Much is gained by making the flues exactly cylindrical, with butt joints, and as their liability to collapse bears a certain ratio to their length, something may be gained by ferrules on the flues at short intervals. I would further suggest as a possible advantage, that the boiler heads be made of wrought iron, that the flues may be held in a state of tension while under pressure.

The question of selection and dimensions of the metal for shell, flues, and heads, with their proportions and arrangement, seems a proper subject for careful and exhaustive

tests by hydraulic machinery, and should be determined by them.

The old method of setting this boiler, by supporting the forward end upon the furnace front, and the rear end upon a cricket, building the walls above the top of boiler, and covering it above the fire line with sand and ashes to the top of the walls, is not satisfactory.

The expansion by heat of a long boiler must be considerable, and in this case it must slide upon, or tilt the cricket, and for results, the metal of the shell at that point is either scraped away or indented by the corner of the cricket.

We desire that the boiler shall be protected from corrosive contact; that it shall be free to expand in proper directions, and that it shall be accessible externally for examination and repair.

I recommend that the boiler be supported upon the side walls, rather than between them. For this method there may be bolted upon each side of the boiler, at the height where the fire line is to be cut off, a sufficient number of lugs to amply support the weight of boiler and contents.

The walls are to be built (without side bars or tie rods) to about the height of the lugs, and those portions of walls directly under the lugs to be finished on top with short wall-plates, upon which are placed small friction rollers for the lugs to rest upon.

The boiler is supposed to be securely anchored to the furnace front, and it will be seen that the rollers can be placed at such an angle as to exactly provide for the compound expansion (lineal and transverse), and by grooving a path for them, the boiler will be a support for the side walls, rather than a tax upon their elasticity. By connecting the lugs with strips of sheet iron (one edge resting on top of wall and the other against the boiler) the fire line is cut off, and if a sheet-iron jacket is turned over the boiler several inches above it, so much the better; but I would not advise to pass the draft through this space.

In closing, a word may be said relative to the brick-work of the boiler-room.

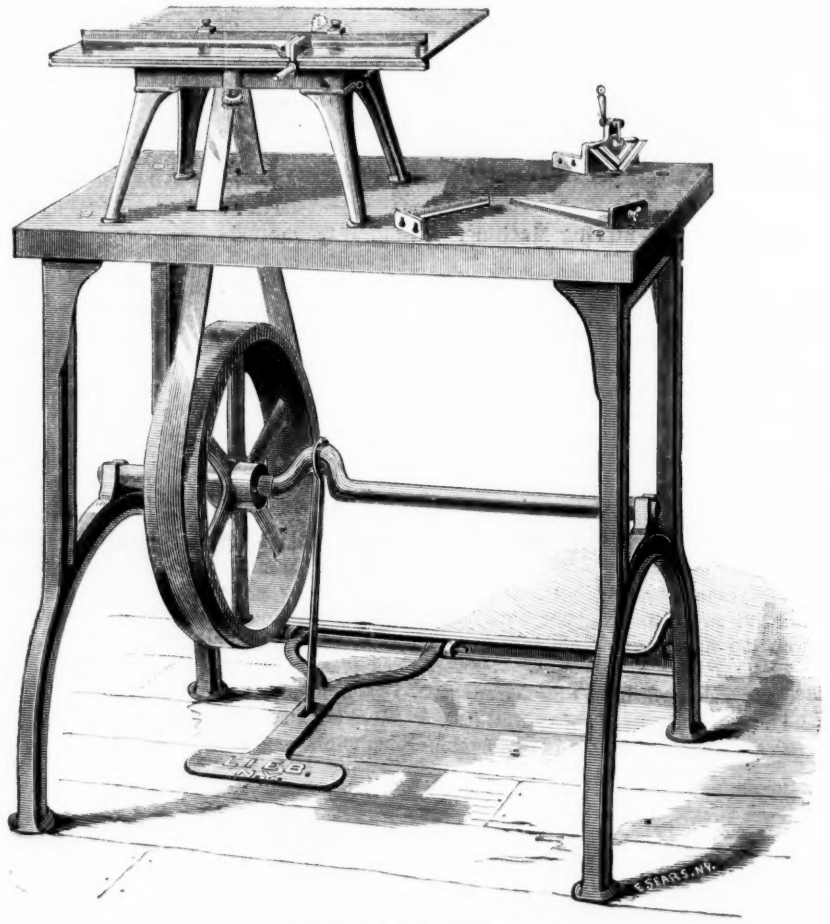
Where the boiler walls are exposed to view (as preferably they should be), if they are built with buttresses or large panels, much will be gained in strength and ornamental appearance, and at a slight cost; and generally there is no good reason why the design of boiler fronts, walls, and steam-engines should not be correct and artistic in outline and detail.

Lieb's New Saw Table.

The saw table represented by the accompanying engraving was designed by Charles A. Lieb, 23 to 27 Vandewater street, New York. It was intended for use in electrotype foundries, to cut brass rules and other metal work incidentally connected with electrotype work. Also for ripping sheet metals in manufacturing electrical apparatus.

Since this table was designed it has been introduced into the Western States where electrotype foundries are not so numerous as they are in some of our large cities. It was the former custom to send brass rules to an electrotype foundry to get them cut to the right length, or mitered, but with one of the saw tables here shown, any printer can do all cutting and mitering of his rules without the delay and expense of sending his work to the foundry. This machine is simple in construction, consisting of a pair of cast iron legs with a bench of solid mahogany bolted fast to the top. Upon this bench is placed a smaller one of cast iron, which forms the saw table proper. The cast iron plate forming the table is hinged at the back so that it can be tipped back exposing the saw and mandrel, thus enabling the operator to readily change the saw. The saw mandrel is of hardened steel, having a single journal ground to a shape corresponding to the anti-friction curve. Each saw is securely attached to a cast-iron thimble having a taper hole to fit the end of the mandrel, being held in place by a nut. This is a notable feature, as the saw must run perfectly true, otherwise the work produced will be of an inferior quality. By attaching the saw securely to the cast-iron thimble, then placing it upon a mandrel and truing it up at the sides with an emery wheel, the operator can always rest assured that the saw, when placed upon the mandrel, will run true. In grinding, the saw is made thickest at the edge, so that it will not pinch. Saws used in the ordinary way will not only run out at the periphery, but are sure to wabble. The projecting end of the mandrel opposite the saw, has a device attached for adjusting the saw accurately for special work, as in cutting miters.

A round bar or guide is shown at the front edge of the table to be used as a support for gauges used in executing various kinds of work. It will be observed that the top of the table is free from slots and holes to catch chips and small particles of metal, which would seriously affect the accuracy of the gauges. In cutting rules and in mitering, lines would not be sufficiently accurate, and gauges have to be used instead to insure the cutting of pieces of metal to standard sizes and lengths.



LIEB'S NEW SAW TABLE.

In cutting rules to standard lengths by the old method, the saw had to be stopped to test the accuracy of the work. With this machine, before starting, the standard gauge is placed with one end against the saw, while the slide gauge, shown at the left, is set to touch the end of the standard gauge. The right-hand slide gauge is then set to just admit the standard between them.

In cutting up rules to exact lengths, their accuracy may be tested between the slide gauges, without stopping the saw, at a sacrifice of time, whenever a measurement is to be made. An extension gauge for cutting extra long rules goes with this machine. The height of the saw table is regulated by a screw underneath, at the front. A long gauge is provided for ripping out long pieces from a sheet of metal, while another gauge is furnished for cutting off at all required lengths. For notching rules, by taking a number of cuts with the saw, the requisite quantity of metal may be readily removed, leaving an opening of the required size.

The miter box is a peculiarly valuable adjunct to this machine, as the rules are cut to the exact length required at first, after which they are placed in the miter box and the ends mitered by cutting them up to an edge. By the old method the rules were cut longer than required, and in mitering they were cut to the necessary length, thus wasting considerable material and the work was not always entirely satisfactory. The miter box here shown will miter either right or left hand equally well. These saw tables may be run by power or by foot and the upper portion may, when desired, be separated from the lower portion and mounted upon a bench.

The Finance Committee of the Louisville Cotton Exposition has begun a systematic canvass of the city for subscriptions to the stock. It is proposed to raise $200,000 before proceeding further with the enterprise. The prospects of an unqualified success are more than flattering. In two hours, on December 2d, $50,000 was subscribed, and the committee expect to secure $300,000 without any trouble. The exposition promises to be, next to the Centennial, the largest ever held in America. Letters are pouring in every day from manufacturers all over the country, and especially in the East, applying for space, and enough of these applications have already been received to guarantee a larger and more comprehensive exhibition than that at Atlanta.

Testing Locomotive Boilers.

The following paragraph recently appeared in the columns of the *National Car Builder*, being furnished them by a correspondent:

"A very effective and cheap method for testing locomotive boilers, either in the repairing of them or in new work, has been invented by Mr. Wiggins, general foreman of the C. C. C. & I. railroad shops, at Delaware, Ohio. The method consists in completely filling the boiler with cold water when it is over the pit. A connection is then made with the steam-heating pipes in the pit from any convenient opening in the boiler, the steam turned on, and the water in the boiler heated. When the water is sufficiently heated to approximate the condition of the boiler when in actual service, a small force pump is connected with the boiler, and as the latter is already full of water, a few strokes of the pump, drawing from a bucket, runs the pressure up to any desired height. The whole arrangement is so inexpensive and so effective that it has been adopted at the other shops of the road."

So far as this process for testing boilers being new is concerned, we were under the impression that it was very old, besides being an example of very bad practice. To fill a boiler with cold water and then attempt to heat it by the introduction of a jet of live steam is likely to result in positive damage to a boiler. Water being a very poor conductor of heat will be heated up quickest in the vicinity of the jet of steam, while at other parts of the boiler it may be cold. There is an old experiment in chemistry which is that of freezing water into ice at one end of a test tube while at the other end it is made to boil, being converted into steam. This experiment very well illustrates the conditions that are likely to occur within a locomotive boiler when filled with cold water and steam introduced. The very thing that we wish most to guard against (unequal expansion) is produced in an aggravated degree. To be sure it is only once or twice, but that once or twice is likely to inflict permanent injury upon the boiler by severe and unnatural strains that would never occur if the boiler were uniformly heated.

In 1874, when the new shops of the Delaware, Lackawanna & Western Railroad were being fitted up at Kingsland, N. J., a pipe 2" in diameter connected with the shop boilers used to drive the stationary engine, extended around the shop to each of the pits. This pipe was placed over head, having a globe valve for admitting steam to each locomotive boiler when necessary. When a boiler was to be tested, connection was made between the steam pipe and boiler. Steam was then turned on, heating the boiler nearly uniformly throughout. A hose was then connected with the injector upon the locomotive, which by turning on steam and water soon filled the boiler with hot water. Usually one hundred pounds pressure per square inch was applied, as these boilers were tested principally to see if they were tight, relying upon a careful internal and external inspection for defects and insuring safety. This method has been used from the date given until the present time. When a locomotive is ready to leave the shop, the boiler is first filled with steam, after which the injector is put to work throwing water into the boiler until it flows from the second gauge. The evaporation from the water furnishes sufficient steam to move the engine from the shop to the round-house; or, if the locomotive is to be put directly to work on the road, a fire may be started as soon as the engine is outside the shop. By using this plan, no smoke from firing up boilers is ever introduced within the shop to annoy the workmen and smut the walls and windows; besides, it is a most economical method. We did not, however, then claim it as original, having seen a similar system in use in several other shops. If our friend in the West would inject hot water into the boilers of his locomotives, instead of following the course described, he would find the process of testing boilers much more rapid and satisfactory, besides greatly lessening the danger from unequal expansion.

I saw last week the highest bridge in the world, 301 feet high. You can put the dome of the American Capitol right underneath it, and the head of the Goddess of Liberty cannot kiss its blarney-stone. The Washington Monument, which is now 275 feet high, I hear, will not rise to its road-bed by a whole story. The Niagara Suspension Bridge is fifty feet lower to the water beneath, and its span is 1,227 feet shorter than this bridge, which measures 2,052 feet, yet weighs only three million and a half pounds, not counting the ties and wooden rails. Yet it cost only $275,000 or about eight cents per pound. I mean the Kinzua viadict bridge on the Bradford and Pittsburg branch of the Erie Reilroad, spanning a gorge in the Alleghany Mountains where a long detour and heavy grades would be the alternative. The Kinzua Creek rises near a small mountain village called Alton, and soon becomes a deep, broad gorge, in whose opening the autumn woods showed for the space of seven miles like a basket of golden flowers and deep, green leaves. The bridge is of light iron towers, like those on the Metropolitan Elevated Railroad above the park, each made of four slender props, and the highest of these towers are ten times trussed or girdered, and there are forty such supports on each side, or twenty pairs, the twenty towers thus rising like lace or cobweb against the zenith itself, and the central towers have a spread of one-third of the height.—Correspondence *New York Tribune*.

Uncle Peter's Remarks.

REPORTED BY "THE BABY."

"Some people never seem to see natural advantages, and many won't believe you can tell them of anything in that line which they hav'nt thought of and abandoned as impracticable. Over in the next town south of here there are three merchant mills, each one run by a high-pressure engine, with plain slide valves. When these mills were built, fuel, in the shape of wood, was plenty and cheap—could be piled in the yard for $1.50 per cord; now it costs $3.25, and McCawber's folks, who own the biggest institution, have concluded to burn coal. They sent for me to come and see what repairs were wanted on their engine. You just ought to see that machine they call an engine. It's in the darkest place about the building, and the only place I could see that was clean was a spot on the connecting rod, where the fireman grabbed hold when he squirted oil at the crank-pin oiler as it went round. I say 'fireman,' but I don't know but I disgrace the trade when I call him even that. You can hear that engine exhaust for half a mile, and I give it as my solemn opinion that they have been furnishing two hundred horse-power of steam for a hundred and twenty horse-power engine, and getting about eighty horse-power for their trouble. This would make their fuel consumption more than twice as much as it should be per barrel of flour made. I've finally worried them into the notion of having an automatic engine, and, boy, that's what I was getting at when I said natural advantages were overlooked. Within ten feet of the hole in the engine-room they call a door, is a little creek, where there is a current of water running all the year round. Now, do you know how I am going to make that creek do something besides furnish water for the boilers? I'm going to make a circulating pump out of it. I'll take some one and a half-inch pipe, and cover the bed of that creek all over for about ten by forty feet, exhaust in one end of the set, and hitch a small vacuum pump to the other, and you have a reliable surface condenser for less than two hundred dollars. That creek runs by every one of these mills, and, when I explained to McCawber that if such a condenser had been put in when the mill was new, and he had kept a good, reliable engineer who knew his business, the saving in fuel expenses would have built him an engine and boiler plant of the best make, then he began to talk new engine, and says he's going to keep it clean and in a separate room from the boilers.

"It seems to me as though some of these machine-tool builders are getting rather mixed in their ideas. They'll tell about narrow belts and high initial velocity for a planer, but who ever heard them say anything about the belt speed of a lathe? Look at that planer! The belt's only inch and a half, but it goes like a buzz saw, and is so slack that it doesn't break once in four months; and look at the cut it takes; good quarter-inch twelve feed, without a struggle. There's a lathe of the best make, with a belt three inches wide, that, to take a cut as heavy as the planer at the same cutting velocity and feed, would show so slow a belt speed it would make you tired to watch it. About the next thing wanted is a lathe with narrow belt and large cone, and if I knew of a firm who made such a tool, I'd order one to-morrow."

There are signs of new commercial enterprise in Venice. A large cotton factory, arranged after the best modern methods, that will employ 3,000 persons and put in motion 100,000 spinning machines, is rapidly building near the maritime station. Again, there is to be erected on the Island of Murana a new glass factory, the necessary funds having been already subscribed, half by English and half by Venetian capitalists. On another island, St. Helena, a factory is to be built for the construction of railway carriages. The latter enterprise promises to be completed at the end of the year 1883.—*New York Times.*

Standard Lathe Tools.

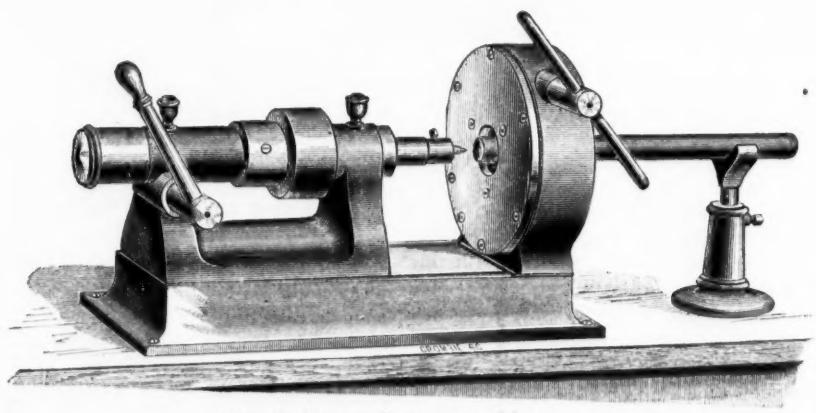
The engraving herewith presented represents one of the standard sets of lathe tools, made by W. C. Young & Co, Worcester, Mass. These tools embrace those common to lathe use, and are carefully made from the best tool steel. Undoubtedly, many small machine shops, where the services of a tool-dresser are not required, will appreciate the intention to supply a standard line of such tools.

Hyde's Bench Centering Machine.

The accompanying illustration represents a centering machine designed for centering stock up to 2″ in diameter, and adapted to be placed on any convenient work-bench. The dogs that hold the work are faced with hardened steel, and operated by a cam movement, so that the wear of the screw does not affect the truth of the chuck.

The drill spindle is arranged to slide through the cone, and receives motion from the lever shown in the cut, which operates it by means of a rack and pinion.

This machine is designed for use where it is more convenient to locate one on a bench than on the floor, and where the use of a machine to center larger stock is not required, or, if desired, it may be placed on a special stand. In its general features, it does not differ essentially from the larger machine



HYDE'S BENCH CENTERING MACHINE.

made by the same firm, and which was illustrated in the AMERICAN MACHINIST of November 5, 1881. It is manufactured by Warren Haskell & Co., 36 Charlestown street, Boston, Mass.

William Shanks, of the firm of Thomas Shanks & Co., Johnstone, near Glasgow, Scotland, writes us, enclosing a number of photographs of massive machine tools made by that establishment. He says: "To give an idea of the large lathe, weighing 100 English tons, we can reduce a wrought iron shaft 1½″ at one cut, ¾″ with front tool and ¾″ with back tool, and this with a feed of three per inch. We suppose this is what your correspondents would call coarse feed. The speed we can run up to is 32 feet of cutting per minute. We have often turned a cast-iron roller, 18½ feet long, 28″ diameter, off the rough casting in 2½ hours—this with our 24″ center treble geared lathe. Can you beat that in the United States?"

Steam Progress.

The excellent address of Professor R. H. Thurston, upon his retirement from the office of President of the American Society of Mechanical Engineers, has been published in *Van Nostrand's Magazine*. We reproduce the portion relating to steam-engine practice.

"In *steam engine practice*, we are not now advancing rapidly. The introduction of the 'drop cut-off' in 1841, by Sickles; of the now standard type of automatic valve gear in 1849, by Corliss; of the high-speed engine, twelve years later, by Allen and Porter; of the combined advantages of jacketing, superheating and reheating, and the definite acceptance of the compound engine in later years, still constitute the complete history of modern steam engineering; but we are, nevertheless, continually gaining a knowledge of the best methods of handling higher steam; of attaining higher piston speed; of securing greater immunity from cylinder condensation and leakage, and of providing against other causes of waste. We are just beginning to perceive what principles must govern us in the endeavor to secure maximum commercial efficiency, and how economy in that direction is affected by the behavior of steam in the cylinder, and by the mutual relations of all the various expenditures that accompany the use of steam power.

"The younger Perkins are still leading in the practice of carrying high steam, and make 400 pounds per square inch—27 atmospheres—a usual figure, while they are experimentally repeating the work of the elder Perkins, and of Dr. Albans, of forty years ago, working steam at 1,000 pounds or nearly 70 atmospheres.

"Unfortunately, the gain to be anticipated by the use of these enormously increased pressures does not seem likely to be very great, unless some decidedly less wasteful kind of engine can be devised in which to work it. The 'Anthracite,' with steam at 300 pounds and upwards, was less economical in fuel than the Leila, carrying about one-third that pressure. Emery has stated that a limit seems to be found at about 100 pounds to economical increase of pressure; and Stevens finds a limit due to the geometrical character of the indicator diagram, inside of 250.

"One of the most interesting and curious, as well as important, deductions from the rational theory of engine efficiency is the existence of an 'absolute limit to economical expansion'—lying far within the previous accepted limit—due to the fact of increase of cylinder condensation and waste with increase in the ratio of expansion, which places an early limit to the gain due expansion *per se*. It seems possible, if not certain, that this point is often actually reached in ordinary engines within the range of customary practice.

"All these facts combined point to a probability that we have little to hope for in the direction of increased steam-engine economy with our standard machinery. Changes in the directions that I have already so often indicated are evidently to be our sole reliance—changes limiting loss by cylinder condensation. Probably the surrounding of the working fluid by non-transferring surfaces is our only resource, in addition to, or in substitution for, the now well-understood expedients of high piston speed and superheating. Until that is done, steam jacketing remains a necessary and unsatisfactory method of reducing losses With a non-conducting cylinder, were it procurable, we might secure very nearly the efficiency of the ideal engine, friction aside, as it would be a 'perfect engine,' and no natural limit would then exist to increasing economy. Were this accomplished, we might at once reduce the cost of steam power by about one-half in our best engines, and to probably one-fourth or one-fifth the present cost in ordinary machines.

"In steam engineering, both physicists and engineers are more than ever attracted to the study of those phenomena which produce the familiar and enormous differences, even in the best practice, between the thermodynamic and the actual efficiencies of engines. The subject lies in that 'march-land' territory between science and practice, which few of the profession can explore from both sides, and it has remained less known than it would otherwise be were it either a matter of purely physical science or of practical experience. Fortunately, we are likely soon to see it thoroughly studied. The debate which arose not long since between Zeuner, the distinguished physicist, as a representative of pure science, and Hirn, the no less distinguished engineer, as an experienced practitioner and skilful experimentalist, in which the differences, to which I have so often called attention, of fifty per cent. or more between the 'theoretical' efficiency and the actual performance of the best steam engines, seem for the first time to have been given prominence in Europe, has led to a much closer study of the matter than could possibly otherwise have been brought about.

"On this side the Atlantic, the discussion of steam engineering efficiencies has been carried on earnestly, if not always with that knowledge that should precede criticism, and it is to be hoped and anticipated that the engineer may ere long be put in possession of positive facts and real knowledge that may aid him in so designing and so applying this greatest of modern inventions as to attain the *maximum maximorum* of economy.

"Ten years ago, nearly, I took occasion to state in a report to the President of the United States on the exhibited machinery of the Vienna Exhibition of 1873, printed later with the other reports of the United States Scientific Commission, that 'the changes of design recently observed in marine engines, and less strikingly in stationary steam engines, have been compelled by purely mechanical and practical considerations. The increase noted in economy of expenditure of steam and of fuel is, as has been stated, due to increased steam pressure, greater expansion, and higher piston speeds, with improved methods of construction and finer workmanship. These several directions of change occur simultaneously, and are all requisite. To secure maximum economy for any given steam pressure, it is necessary to adopt a certain degree of expansion, which gives maximum economy for that pressure under the existing conditions.

"'This point of cut-off for maximum efficiency lies nearer the beginning of the stroke as steam pressure rises. For low pressure a much greater expansion is allowable in condensing than in non-condensing engines; but, as pressure rises, this difference gradually lessens. For example, with steam at 25 pounds by gauge, the best economical results are obtained when expanding about three times in good condensing engines, and about one and a half times in non-condensing engines. With steam at 50 pounds, these figures become five and two and a half respectively; and at 75 pounds, the highest efficiency is secured in condensing engines, cutting off at one-fifth, and in non-condensing engines with cut-off at one-third stroke.

"Owing to the decreasing proportional losses due to back-pressure and to retarding

influences, the departure from the economical result indicated for the perfect engine becomes greater and greater, until, at a pressure of between 200 and 250 pounds, the proper point of cut-off becomes about one-sixth or one-seventh, and very nearly the same for both classes of engines, and the increase of efficiency by increase of pressure and greater expansion becomes so slight as to indicate that it is very doubtful whether progress in the direction of higher pressure will be carried beyond this limit.

"These conclusions were derived from careful observation of the performance of unjacketed 'single cylinder' engines and a comparison of the ratios of expansion of those exhibiting greatest economy. It is interesting to note that later, and probably more reliable methods of comparison than were then familiar, go far in confirmation of the opinion then expressed. I think that I have been able to prove the existence, as just stated, of an 'absolute limit of economical expansion,' which, whatever the ratio of steam pressure to back pressure, in all ordinary heat engines probably falls within the range of familiar practice. Advance beyond the best efficiency of to-day in ordinary engines seems likely to be very slow and not at all likely ever to be very great.

"Extended experiments will be needed to secure all the facts demanded by the designing engineer and to furnish constants for the approximate theory of efficiency, which only is, as yet, his sole guide. An exact theory is one of those things for which he hopes, but which he does not expect soon to see. Some experiments have already been made, but they contribute only the first step. Those made by order of the Navy Department, and principally by Isherwood, and those of Hirn, have hitherto been our sole guide, but a new line of more direct investigation of the laws governing internal, or cylinder, condensation has been inaugurated by Escher of Zurich, and we are able to see a fair prospect of obtaining definite information in this direction.

"Escher finds, in the case taken by him, that this waste varies nearly as the square root of the period of revolution and of the pressure, and is nearly independent of the back pressure — conclusions which are especially interesting to me as corroborating assumptions, based on general observation and non-experimental practice, made by me previously in developing an empirical system of design.

"In steam boiler engineering, the only observable change seems to be the slow but steady gain made in the introduction of water-tube coil boilers and sectional boilers, and in the extension of a rational system of inspection and test while in operation. To-day, the intelligent owner of boilers secures inspection and test, with insurance, by intelligent engineers and responsible underwriters, as invariably as he obtains inspection and insurance of his buildings. Under this system, steam boiler design, construction and management is becoming a distinct art, based upon real knowledge. The system of forced circulation proposed by Trowbridge, and perhaps others, seems to me likely to prove useful in the solution of the problem to-day presented."

The daily papers state that Engine No. 222, in charge of Engineer John Hogan on the New Jersey Central Railroad, recently made a run of 87 miles in 91 minutes, including a stop at Green Brook for water and at Bound Brook for inspection. The run from Bound Brook to Trenton, 27 miles, was made in 27 minutes.

One hour of the long evenings of the next four months, spent by the apprentice in studying some special branch of engineering, will astonish him with the results.

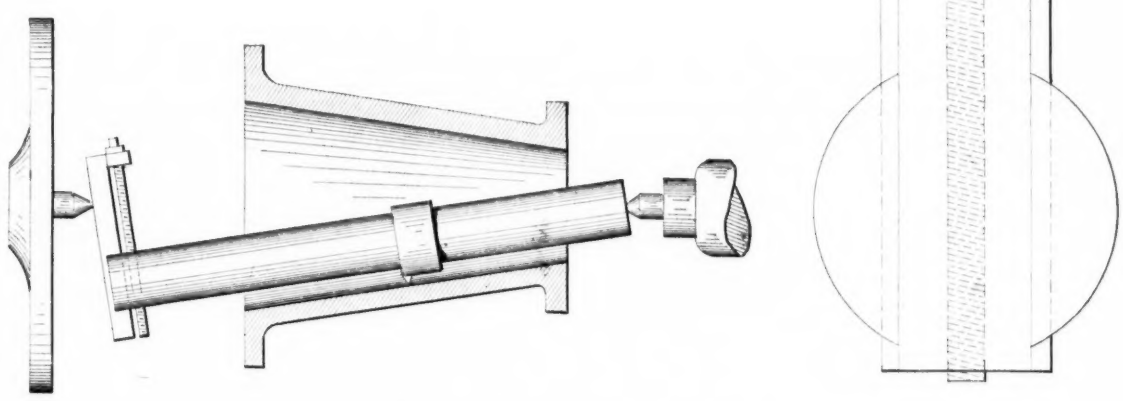
Boring Bars.

Since the publication of the cut and description of Mr. Foote's boring bar two weeks ago, we have received the following three communications on the subject:

Editor American Machinist:

We have noticed from time to time, in your columns, boring bars and attachments for various kinds of work, but until recently they have called for no special attention, because no mention has been made of an intention to patent them; but since reading in your issue of December 9, 1882, a description of a boring device for taper holes which Mr. Foote, of Helena, Montana, proposes to patent, we feel it is due to ourselves and the public to make a statement.

For almost twenty years past, the manufacture and use of boring bars has been one of our specialties; using them in our general business—as largely we have—opportunities have arisen where special devices would facilitate our work very largely. We have had a device similar to Mr. Foote's in use in our shop for at least eight years past, and never thought so simple an appliance worth patenting. It has an adjustable throw at end of bar, carrying it as much eccentric as necessary to give the taper. We often do taper boring with it, and it was made in the first place for a lot of taper valves, to be worked by a governor on a marine engine—Jenkins & Lee make of governor. They were bored and faced formerly on a boring mill, but it failed to do as accurate work (as our appliance) and we obtained the work.



PEDRICK & AYER'S BORING BAR.

We also have a device for our portable bars, for boring taper holes in large cranks, or any other place where taper holes are needed.

The holes referred to above were 30" long; greatest diameter 10½"; least diameter 7". We also have other devices, where the work revolves and the tool feeds along the work.

Inclosed we send drawing of our appliance, the similarity being very striking, as you can readily see.

PEDRICK & AYER, Proprietors,
L. B. Flanders' Machine Works,
Philadelphia, Pa.

Editor American Machinist:

I see in a late issue of the AMERICAN MACHINIST a description of a new boring bar, invented by Geo. B. Foote, of Helena, Montana. Now, I rather like it, having used the same among my shop-kinks for the last fifteen years in the shop of John T. Dunkin, 552, 554 and 556 West 27th street, New York. It was first made to bore out the taper holes in engine cranks to receive the pin, in a lathe that had no compound rest. Since then we have used it on a variety of work, and always considered it a good tool. To be more specific, I made two of them—one about 1½" diameter, and one about 2" diameter. If anyone doubts the above assertion, it can be very easily proved, as they are at present stored in a building owned by Fire Commissioner Gorman, in West 27th street, near 9th avenue. They are not patented, such a thing not being thought of at the time, but were simply made to accomplish certain ends, such as come up in nearly all shops where those in charge are bound to do the work, but are rarely thought of afterward as possessing any superior merit. I may as well state here that we made a tool to bore a taper hole in a drill press, which is in the same place as the bars.

I do not write this in order to depreciate the merit due to Mr. Foote, but to show that when occasion requires a man can do almost anything he wants to do. I am very glad that Mr. Foote has succeeded. My bars are identical with Mr. Foote's in all respects, except the ball in the end of the bar, which I consider a first-rate idea.

I sincerely hope that he will get a patent on the bar, and be successful in its introduction, as I consider it a first-class tool where taper holes are to be bored on the carriage, or on the face-plate where there is no compound rest, or on the face-plate where the hole is very deep, as it is very much stronger than a tool hanging over the rest.

GEORGE SHIRES.
328 West 30th street, New York.

Editor American Machinist:

The "New Boring Bar," described on page 7 of your issue of Dec. 9th, we have used in our shop for the past thirty-three years. With this bar you can bore to any taper, in a lathe that only bores straight, by making the bar stationary and moving the center to one side. It is an excellent tool for occasional use.

Troy, N. Y. WILLIAM COUTIE & SON.

LETTERS FROM PRACTICAL MEN.

Faults in Engine Lathes.

Editor American Machinist:

Your valuable paper I see has had the courage to take up the subject of lathe construction, and not without need.

It is a source of great annoyance to make a purchase of a lathe of a given *swing*, and to find out that with an ordinary piece of work it chatters as if it had the ague.

The trouble is that most American makers are afraid of putting too much metal into their lathes, especially in the saddle or carriage.

Some makers are now building a fair sample of fast and loose heads; still there is much improvement to be made in the construction of the journals, of the fast head, in order to guarantee a fine working true spindle. They require also the means of adjusting the position of the fast head on the shears, in order to get its center exactly in line with the loose head center, and to abjure the abominable method of placing it upon V's. You might just as well build a house upon stilts; it would be just as substantial. It is necessary, in order to get a first-class working lathe, to do away with the V system and substitute the plain flat shears.

Lathes require to be rigid in construction, and rigidity is only attained in such a machine by good surfaces, and a proper distribution of metal. I do not think tha you could find in all England a lathe shear at the present day on the V plan, unless it is in South Kensington Museum, placed there as a relic of our great-grandfathers. The saddle or carriage is extremely faulty in some American lathes. They lack surface, base and depth of slide. The tool-post is generally some lightly constructed arrangement, altogether inadequate to the important part it has to perform, and is extremely limited as regards the size of tools you can get into it.

Handles seem as though they had been specially designed to be in the way of their next-door neighbor, and the simplest and best working of all feeds, viz., the friction feed, is in some cases ignored.

In order to get a feed in or out of gear one has to pull and push on a small knob (shaped in the worst possible manner to get any purchase on it) as though his dear life depended upon it; whereas by the friction arrangement of feeds, all one needs to do is to tighten or slacken a nut.

Another bad feature adopted by some makers is the placing of the screw behind the lathe, necessitating one's reaching over the shears and everything to engage or disengage the nut. The plan universally adopted by English machine tool-builders of making a gap in the shears to admit of pulley work, would be found of immense advantage, and in conjunction with pulley work an automatic crowning arrangement would be of advantage. None of these devices are new; they need therefore no inventing. They represent the boiling down of years of experience of some of the most noted tool-makers in the world, who agree that all working surfaces should be certainly scraped true.

American makers build good tools when they so desire. Let antiquated notions, which have long since been exploded, be abandoned and adopt good ideas wherever you can get them. Then shall we have lathes which will be eminently suited to the work of the present day; not scratching a cut off, but taking a good, bold and firm cut and proving a profitable investment.

W. B. YATES.
Adams, Mass.

Machine Foundations and Lathe Fixtures.

Editor American Machinist:

I was much pleased with an able editorial in a late number of the AMERICAN MACHINIST on machine tool foundations. Even after the stone has been laid, the machine is often hastily set down on a little mortar, or adjusted with wedges. If a large, true surface plate were applied to lathe beds or shears, very few would be found to stand the test. As your article stated, "your ways would be either sagged or twisted, and the only way a workman could produce a barely respectable job would be to feed out and in and make a liberal use of the file." Some men make a liberal use of the file on jobs where the tool would leave much better work.

I have seen splendid turning done on large piston rods and like work, with a perfectly ground and set tool for the water finishing cut, on a first-class lathe. It is impossible to feed out and in without showing it, especially with a flat or square-nosed tool, and the less filing done the better. I can remember the time when in some shops piston rods used to be draw-filed after they left the lathe—a ridiculous practice.

The foundation is just as particular as any other part of the machine, and there ought to be much pains taken in bedding the feet of the legs, even though a cast iron base-plate with chipping strips for the feet to rest on, has to be bolted down on the stone, and the feet planed.

The less use made of a file on lathe work,

whether on wrought iron, cast iron, or brass, the better. Tools and scrapers leave far better work, besides a great saving in files and time. It wastes a great deal of time polishing file-marks out. If more attention were paid to proper tool grinding, and properly constructed backstays or traveling-rests to follow the tool, far better work could be produced at one cut than is now done in many country shops, where the practice is in turning long slender shafts, to hastily drive a misshapen center-punch into each end, make an abortive attempt to true the middle with a needle-pointed tool by hand, run it in a steady rest, and start the lathe at a speed required for turning small truss work with dry cuts. This plan requires three cuts with a fine feed and an excessive use of the file, and when done will be found to be very little truer than the rough iron.

All small or medium lathes ought to be furnished with Clement or adjustable driving studs on the face-plate, something like such as are used on car-axle lathes, and the dogs should either have the screw on the side or have the hub for the screw long enough for the driving stud to touch it. The dog should have round ends. This plan works well on shafting, piston-rods, etc., and makes less strain on the live center. A dog or carrier, with a crooked or cranked tail is more liable to twist and chatter than a double-ended straight one.

In turning long shafting, or in cutting leading lathe screws, the double driver is much the best to use. Great care ought to be taken when the shaft gets warm to slacken the dead center sufficient to allow for stretching or expansion. Single driving and neglect to adjust the centers leaves crooked work.

The chief thing in lathe construction for heavy cutting, next to powerful spindle gearing, is to have everything rigid and tight. The centers ought to be large with short projections and the spindle of the tail stock should project as little as possible. The tools ought to be caught as short as practicable.

One cause of tools being so prone to dig in when they move up and touch the heavy cut, is from letting the tool and center project too far. The cross slide ought to be bolted down fast with an adjustable gib.

What is gained in handy devices for raising and lowering a tool post is often sacrificed to want of rigidity. Moodna of Orange Co., New York, used to make first rate lathes for power, stiffness and durability. The plan of having conical-necked spindles in steel bushes is the best one. Where the front bearing runs in brass boxes it generally hangs down in time and produces taper work in both boring and turning.

I wish some more capable man would give us something on the different systems of working in England and this country. It is a generation ago that I left there, and there must be great changes in that time.

The duplex slide-rest system on lathes seems to be more in use there than here. Whether any more headway is made in turning tire on driving wheels or not, I can't say. I should think more headway would be made and a coarser feed used by using four tools than two, with two upside down on the back.

The turret head or capstan-rest lathe is a new departure, and is, in my opinion, destined to come more into general use. If the fast headstock is properly constructed, and furnished with special chucks and face-plates, it would be a far better plan for boring on many jobs, than turning out small holes with springy internal tools, or boring with flat drills. Say in a hole of three inches in cast iron, the double cutter in the end of the bar would take it out at one cut, and then the head could be loosened and moved round for the finishing cut. Much work could be done that way.

As regards the apprenticeship system, I hoped to see it revived and fixed rates and printed rules adhered to, so as to prevent officials from making flesh of one and fish of another. I also hope to see the promoted laborer and butcher-shop system abolished. There are old-established eastern locomotive works that used to do good fitting, that have, of late years, been botching up their work in a disgraceful way.

Fort Wayne, Ind. VETERAN.

Stationary Engineers' Organizations.

Editor American Machinist:

The prospects of the National Association of Stationary Engineers begin to look bright, and it is no more a venture, but an assured success. The stationary engineers of the country are waking up, and every day brings letters of inquiry from different cities asking for instructions in forming and operating societies. Since our Convention at New York in October, two new societies have been organized, one at Worcester, Mass., and one at St. Paul, Minn., and we expect within the next two weeks to be able to report the forming of at least two more. There were twelve societies represented at the convention. We now have fourteen. At that rate of increase until our next annual meeting, October 1883, there will then be at least forty societies in the United States. The success of the institution rests upon the shoulders of every member of the different societies. They must work if they would win. They must not think that the officers have all the work to do. There is not an officer of either the National or subordinate associations who does not have his daily work to attend. We have to be in our respective engine rooms just as punctually, and work just as many hours as any other engineers. In order to make engineers associations successful, every engineer of good standing should join. They must not say, "Mr. A. or Mr. B. are not good men because they don't know how to do machine work. I am a machinist; I learned my trade in the shop; I am not going to join a society that has for its object the educating of men to be engineers," etc. Let those parties stop for a moment and consider how little they know, of themselves, about the engine, and how much they are indebted to their whole-souled predecessors for their knowledge. Let such join, and they will soon see that Mr. A. is perhaps far superior to them in engineering, and able to teach them many things they did not know before, while they from long experience, can impart useful knowledge to those who are younger. The National Association insists that the engineers' societies shall have nothing to do with strikes, that they shall not interfere in the matter of wages between employer and employe. We believe that every man will get his just deserts; if he is careful and attentive, and does his duty, he will be appreciated and rewarded, and if he is careless and wasteful, he will receive his just deserts.

Let all good engineers take interest in forming and maintaining engineers' societies. Let employes investigate these societies, and they will find that such organizations are more for their interest than many of them are aware of. Then let them assist us pecuniarily to procure suitable halls, libraries, and models, with which to illustrate the workings of steam machinery, and in future generations the profession of engineering will be one that is highly respected and appreciated in this country; then will it not be considered lower than the occupation of the common laborer.

A. M. DAVY,
Secty. Nat. Asso. of Stationary Engineers, Detroit, Mich.

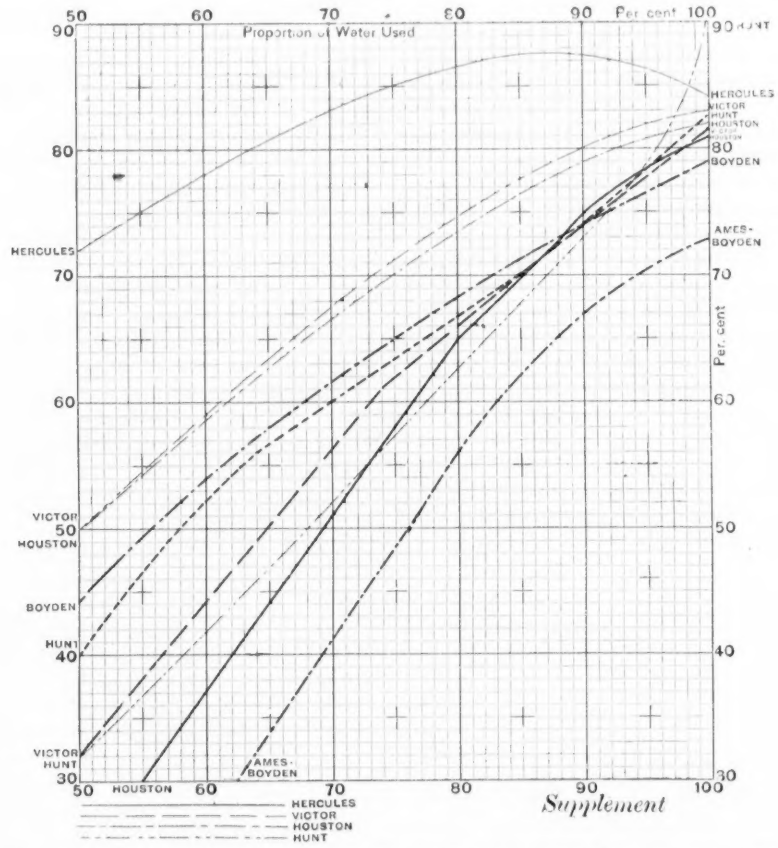
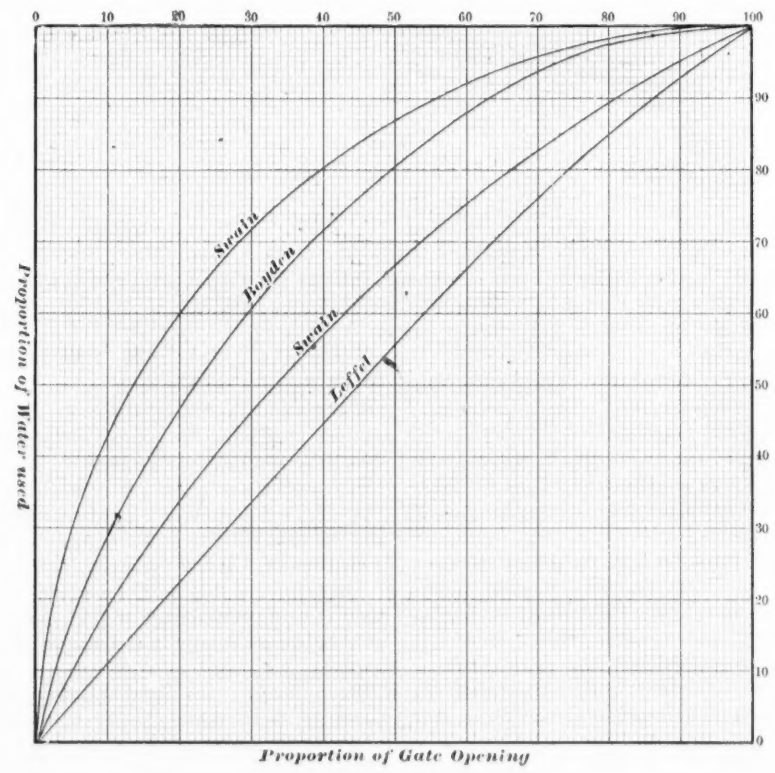


DIAGRAM B—PROPORTION OF POWER OF WATER REALIZED BY WHEELS WHERE WATER PASSAGE IS CUT OFF BY SHARP EDGE OF GATE.



Efficiency of Turbines as Affected by Form of Gate.

Editor American Machinist:

Whoever relies upon the diagrams *B* and *C*, published in the AMERICAN MACHINIST of June 24, 1882, and the remarks in connection therewith, as a basis for their conclusions on the "efficiency of turbines as affected by form of gate," is liable to be deceived thereby as regards most of the wheels therein named; for, in some cases, the lines indicate only the best results ever obtained from the wheels they are supposed to represent, thus misleading the intending purchasers. In others, there is indicated only the poorest results, therefore doing the manufacturer an injustice.

1. In order to give a more correct and intelligent view of the matter, four additional lines have been plotted on Mr. Webber's diagram *B*, which is presented herewith as diagram *B* supplement, showing the results of tests at part gate, "sharp edge" part gate, too, to wit: the "Hercules," with a plain cylinder gate, represented by the sharp, full line; the "Victor," with register and garniture; the "Houston," with simple register; and the "Hunt," with a plain cylinder gate, represented by broken lines, all as shown in foot margin of the diagram.

2. Diagram *D*, page 7, is presented in lieu of Mr. Webber's diagram *C*, and on a scale corresponding with diagram *B* supplement, the lines, with two or three exceptions, having been deduced from independent data.

His "Swain," "Hercules" and "Leffel" lines were transferred without material alteration. The two "Risdon" and "American" lines, and the second "Swain," "Hercules" and "Leffel" lines are new. The "Tyler," "Tait" and "Success" lines have been omitted for the sake of brevity and perspicuity.

3. It must be seen by an examination and comparison of the several diagrams, even by the unskilled, that there must be something other than *gates* and "unbroken water passages or chutes" in the make-up of a good turbine wheel, for we find on diagram *D* lines representing results on the "American," "Hercules," "Swain" and "Risdon," all as low, and lower, than the lines on diagram *B* supplement, representing "Victor," "Houston," "Boyden" and "Hunt," and, what may seem yet more paradoxical, the "Hercules" line averaging higher than any other on the list.

Note the closeness of the "Victor" and the "Houston" lines, differing only 1 per cent., and in contrast the "Hercules" and the "Hunt" lines, where we find a difference of 46 per cent. between extremes at full gate and at one-half water, shown on diagram *B* supplement.

4. With "unbroken water passages," we have great differences at half and three-quarter gate in nearly all, in some even at full gate; that, too, from the same make and style of wheel, for we find by diagram *D* that the "Risdon" ranges from 70 per cent. to 90 per cent. at full gate, from 55 per cent. to 80 per cent. at three-quarter gate, and from 30 per cent. to 62 per cent. at one-half gate.

The "Swain" ranges from 72 per cent. to 84 per cent. at full; from 61.5 per cent. to

80.5 per cent. at ¾; and from 35 per cent. to 68 per cent. at ½ gate.

The others represented all show similar variations, only less in degree.

We may safely consider the low "Risdon," "Swain," and "American" lines as exceptional cases, derived from older designs than those now in use. The higher "Leffel" may also be supposed to be exceptional; having been got up expressly for the occasion, the wheel floats and guides having nicely finished surfaces.

5. Hence, whoever attempts to judge of the efficiency of a turbine by the kind of gate it may have, will be liable to serious disappointment should he purchase without other discriminating examination.

6. Mr. Webber does not seem to make any such discrimination as should be made between a "sharp edged" cylinder and a "sharp edged" register gate.

A "sharp edged" gate is one without "garniture," "flange," or "adjutage" of any kind, to direct the water towards the opening uncovered by the gate; the plain, thin cylinder of the Fourneyron, or Boyden, for example.

The "Burnham" and the "National" wheel gates are both examples of thin, "sharp edged" register gates.

7. Whether the gates are "sharp edged" or "flanged cylinders" does not make so much difference in the discharge of water as he indicates, nor for the reasons he gives. There must be other things that have more influence upon the discharge, or induction, or both, than the simple difference between "garniture" and no "garniture," "flanged" or plain cylinder. The facts are, that inventors have been striving for "good part gate turbines" without a thought of diminishing the quantity of water delivered to the wheel, and have accomplished wonders, surmounting theoretical impossibilities.

He truly says: "The Swain and Risdon wheels have cylinder gates, have an outside garniture attached, which prevents the current from being abruptly broken, and have both attained very high results at partial gate." The lower diagram (page 6) shows the proportional discharge of water to gate opening on the Swain, Boyden-Fourneyron, and the Leffel turbines. By an examination of this diagram we will find that the proportion of water used to the gate opening varies very much on the same make of wheel, and further, that very high results are not incompatible with a large flow of water through a small opening of the gate.

8. Note what he says of each of the wheels he mentions, then compare the several diagrams carefully. The Risdon turbine would, no doubt, show similar high discharge lines with the Swain, as shown on diagram, if plotted from the proper data.

9. In conclusion, permit the remark, that, although the system of testing turbines in vogue the past few years has not been without useful results, it might and should have been so conducted as to have been of vastly greater value to all. To theorize, then experiment solely to prove the theory of the truth, is a long way to the truth.

HYDRO DYNAMICUS.

Standard Sizes.

Editor American Machinist:

I wish to call the attention of your readers, especially manufacturers, to the above subject. I find that the word standard is something established by public opinion, as is shown by the Committee of the Franklin Institute, Philadelphia, in 1864. Now, for one, I doubt if the word standard amounts to anything except a byword. I recently purchased two graduated steel scales, one two feet long, and another one foot long. Each scale was always getting me into difficulty, which I was some time in fathoming. Investigation proved that the one foot scale was about one foot and one thirty second of an inch; standard in name only.

Another sample of standard sizes relates to gauges recently examined by myself, just as they came from the manufactory. Taking two of the same size; one for internal and one for external work, it was found to require some force to push one into the other, and upon separating them they came apart with a loud ring. Upon trying one that is double-ended, and has been in use for the past two years into the small size of the new pattern, they were found to be as nearly perfect as one would ever expect or wish for.

Recently an order was received by a friend of mine for a large number of solid wrenches, to be milled exact to size adopted by the Franklin Institute. In this case gauges were sent. Another order was received from another firm for a number of wrenches to fit finished hexagon nuts, United States standard sizes. This time finished nuts were furnished for sizes. Both orders came from the city where this so-called standard size received its birth. There was found to be just one-sixteenth of an inch difference in size; so your readers can judge for themselves whether there is such a thing as a standard size, and who follow it.

I have examined three different books to find out the sizes adopted by the Franklin Institute, and they all claim to be accurate. The rule given in Haswell's Pocket-book for Mechanics, says: "For dimensions for a rough nut: the width between the parallel sides of both head and nut 1½ times the diameter of bolt, to which is added ⅛ of an inch. For a finished nut: the width between the parallel sides should be $\frac{1}{16}$ of an inch less than for a rough nut."

In the illustrated catalogue of Hooper and Townsend, manufacturers of finished and cold punched nuts, they say that the thread and outside of each nut are made to an accurate gauge, and to the standard adopted by the U. S. Government. There is another standard size again. There is to be found in Nystrom's revised edition of Pocket-book for Mechanics, another example of the so-called U. S. standard, which is not like either of the above as far as sizes go.

So the reader can judge for himself what the so-called U. S. standard is. If any of your readers can inform me why there is so much difference, I will thank them very much; but I should like to caution them just to be sure that they are right, then go ahead. There is a nut for somebody to crack.

Grant & Bogert, C. E. SIMONDS.
Machine Tool Works,
Flushing, L. I.

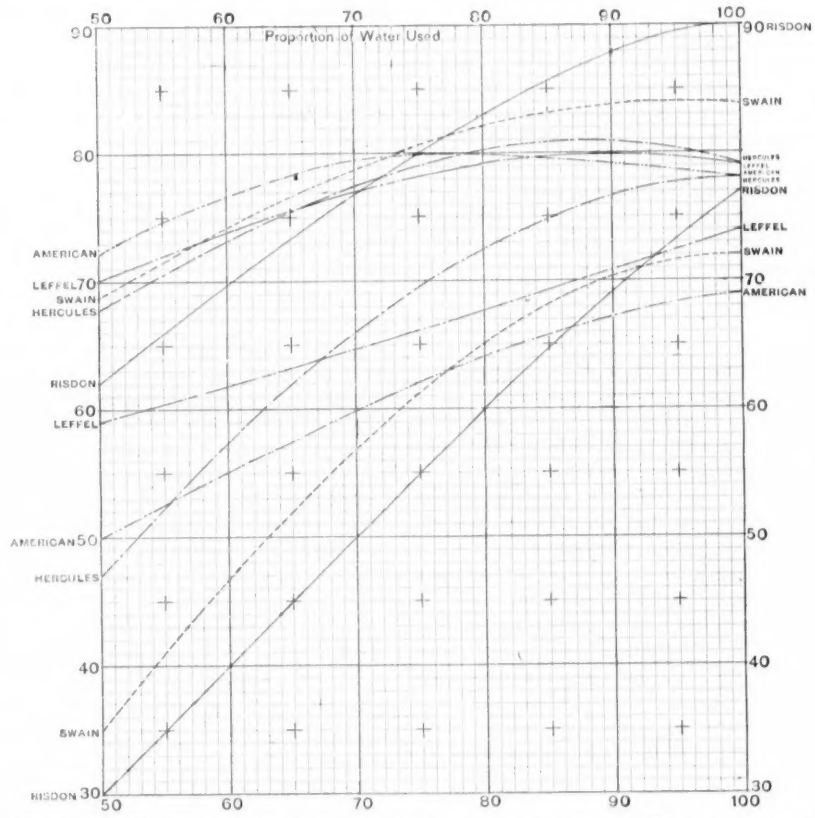


DIAGRAM D—PROPORTION OF POWER OF WATER REALIZED BY WHEELS HAVING UNBROKEN WATER PASSAGES OR CHUTES.

The Metric System.

Editor American Machinist:

Has the attention of your readers been called to the persistent effort, quietly and insidiously made, to enforce by Federal legislation, the use of the French metric system in this country, and the prohibition of the use of the common, or British system, now in use?

American machinists are very greatly interested in this question, as every handworker is, and it seems to me, it should be thoroughly ventilated by that portion of the press which is most likely to reach their eyes and command their attention.

Is any change, say from inches, feet, and yards to centimeters and meters advantageous and desirable? I believe that workingmen, having fully informed themselves—*pro* and *con*—would be decidedly opposed to any change to the French system, as proposed by this law, if indeed it should become a law. It failed of passage at the close of the Hayes' administration, partly because it was known that the President elect, General Garfield, was unlikely to approve it, he being a well-grounded believer in the British inch as a proper unit.

The attempt is to be renewed in the coming Congress, and now is the time for its general discussion, in order that the voice of the "creators of capital" may be expressed upon the propriety of this legislation.

Information on the general subject can be obtained of the International Institute, either at 349 Euclid Avenue, Cleveland, Ohio, or at 375 Tremont Street, Boston, Mass., who mail printed matter gratis to any address. Perhaps by printing this you may confer a favor on your readers as well as on the general public. W. C. C.

Mobile, Ala.

Automatic Cut-Off and Slide Valve Engines.

Editor American Machinist:

The following is from the *American Miller* of a recent date:

"The waste in fuel in an eighty-horse slide valve engine, consuming five pounds of coal per hour per horse power, as compared with an automatic cut-off engine, same power, doing its work with four pounds of coal per hour per horse power, is one pound of coal per hour per horse power; or, in a year of 300 ten-hour days, $80 \times .66\,964 = 53.5712$ gross tons. In a year of 300 twenty-four days, it would be $80 \times 1.60\,714 = 128.5712$ gross tons."

If the above statement is intended to show the importance of one pound of coal per horse power per hour, in an eighty-horse power engine, the results given are two small by half. If, as it seems, it is intended to promulgate as a dogma, the idea that the presence of an automatic cut-off engine silences all questions of steam engine economy, by a majority of 20 per cent. saved in fuel; I also question that part of the statement.

The automatic cut-off is such an excellent device for governing an engine, that its praises have been sung and its virtues extended until the multitude are ready to exclaim, "The *Governor* can do no wrong," and I fully realize the rashness of the present writing.

One pound of coal per horse power per hour in an eighty-horse power engine is 80 lbs. per hour, or 800 lbs. in ten hours; 800 lbs. $\times 300 = 240000$ lbs. One gross ton is 2240 lbs. $240000 \div 2240 = 107.1428+$ gross tons. For 300 twenty-four hour days the results would be as ten is to twenty-four, or 107. $1428 \times 24 \div 10 = 257.1424+$ gross tons, or double the amount shown in the paragraph quoted.

I know of both, automatic cut-off and slide-valve engines, now running, in which I have no doubt the waste in fuel is fully equal in proportion to that shown in the above statement, but the fault is not with the kind of valves used. It is in using a large cylinder to do a small amount of work; or, in other words, the engines are underloaded. With the underloaded engine is where the automatic cut-off is supposed to come in and bridge over the ignorance of men who do not know how much power they want, nor how much power an engine will give; but often the chasm of ignorance is too great for the cut-off to span.

I know of a splendid eighty-horse power automatic cut-off engine that is doing its work with 30 pounds of steam. I believe that a slide-valve engine, with a cylinder so small as to require 60 pounds of steam to do the work in the same place, would save a large amount of fuel over the present arrangement.

The smaller cylinder would have less cylinder condensation—would have a load to carry—some resistance to act upon, and not be kicking against air.

Steam, like exploded gunpowder, to be effective, must meet with some resistance. On one 4th of July I thought to make a great noise and get rid of an unsightly object at the same time, by exploding a quarter of a pound of rifle powder in a large rotten stump. When all was ready I fired the fuse, and got out of the way so fast and so far that I did not hear the explosion at all, but on seeing the smoke, I ventured back and found the stump unharmed, except by the loss of about a quart of rotten wood, blown out through one side. If that powder had been exploded in the heart of a sound hickory stump, there would have been a small earthquake, and the stump would have been blown to atoms, but in the rotten stump there was no resistance for it to act upon. Steam is an expansive, if not an explosive agent, and what chance has it to transmit power, with the piston flying before it at the slighest pressure? The effect of slight resistance is seen at the end of the exhaust pipe, when the resistance of the atmosphere is so little, that the steam becomes mild mannered as soon as it strikes the air. In an underloaded engine this mild disposition begins as soon as the steam reaches the piston, and often the hardest work that the steam has to perform, is to get through the scarcely opened ports of the automatic cut-off engine.

It is difficult to make a machine perform two directly opposite duties at the same time, and do both of them well. Boilers might be built and arranged so as to extract double the heat from fuel that they now do, but they would lose their usefulness to furnish steam, and become simply heat extractors.

Whenever a man needs to use a certain volume of steam, and gets a large cylinder so as to cut the steam off and save it, he attempts to use his steam and save it too, and men often think that they not only do save it, but get more power out of it than it ever contained.

The automatic cut-off engine generally gets a better engineer than the slide-valve engine gets, and that is a good feature of it. I wish that some complication of mechanism, or circumstances, could be evolved that would eradicate the idea that any and every greenhorn is competent to run a slide-valve engine at sight. Then there would be less complaint of the inefficiency of the slide-valve engine. ANTHON.

Defiance, O.

AMERICAN MACHINIST

PUBLISHED WEEKLY

BY

American Machinist Publishing Co.

HORACE B. MILLER, Pres't.

JACKSON BAILEY, Vice-Pres't.

LYCURGUS B. MOORE, Treas. and Sec'y.

96 Fulton Street, New York.

JACKSON BAILEY, Editor. HORACE B. MILLER, Business Manager.

LEWIS F. LYNE, F. F. HEMENWAY, } Mechanical Engineers.

The American News Company,

Publishers' Agents, New York.

The International News Company,

11 BOUVERIE STREET, (Fleet Street), LONDON, ENG., will receive subscriptions for the AMERICAN MACHINIST at 16/8 per annum, postage prepaid.

DEALERS SUPPLIED BY

The American News Company, New York.
The American News Company, Denver, Col.
The American News Company, Kansas City, Mo.
The American News Company, Omaha, Neb.
The American News Company, St. Paul, Minn.
The New York News Company, New York.
The National News Company, New York.
The New England News Company, Boston, Mass.
The Central News Company, Philadelphia, Pa.
The Western News Company, Chicago, Ill.
The St. Louis News Company, St. Louis, Mo.
The Cincinnati News Company, Cincinnati, Ohio.
The Detroit News Company, Detroit, Mich.
The Pittsburgh News Company, Pittsburgh, Pa.
The Baltimore News Company, Baltimore, Md.
The Rhode Island News Company, Providence, R. I.
The San Francisco News Co., San Francisco, Cal.
The Brooklyn News Company, Brooklyn, N. Y.
The Williamsburgh News Co., Brooklyn, E.D., N. Y.
The Newark News Company, Newark, N. J.
The Northern News Company, Troy, N. Y.
The Albany News Company, Albany, N. Y.
The Washington News Company, Washington, D. C.
The New Orleans News Company, New Orleans, La.
The Montreal News Company, Montreal, Canada.
The Toronto News Co., Toronto, Ontario, Canada.
The Toronto News Co., Clifton Branch, Clifton, Ontario, Canada.

SUBSCRIPTION.

$3.00 a year, in advance, postage prepaid in the United States and Canada.
$4.00 to Foreign Countries, postage prepaid.

ADVERTISING.

Transient, 35c. per line each insertion.
"Business Specials," 50c. a line.

EDITORIAL ANNOUNCEMENTS.

☞ *Positively we will neither publish anything in our reading columns for pay or in consideration of advertising patronage. Those who wish to recommend their wares to our readers can do so as fully as they choose in our advertising columns, but our editorial opinions are not for sale. We give no premiums to secure either subscribers or advertisers.*

☞ *Every correspondent, in order to insure attention should give his full name and address, not for publication, but as a guarantee of good faith.*

☞ *We are not engaged in procuring patent rights, or in selling machinery; nor have we any pet scheme to advance, or hobby to ride.*

☞ *We invite correspondence from practical machinists, engineers, inventors, draughtsmen, and all those especially interested in the occupations we represent, on subjects pertaining to machinery.*

☞ *Subscribers can have the mailing address of their paper changed as often as they desire. Send both old and new addresses. Those who fail to receive their papers promptly will please notify us at once.*

NEW YORK, DEC. 23, 1882.

CONTENTS.

	PAGE
Improved Sewage Pumping Engine	1
Burning Smoke and Sparks	1
New Screw Slotter and new Cutter Grinder	2
The Growth of the Steam Engine	2
The Performance of Locomotives	2
Steam Boilers. By N. H. Brown	2
Lieb's New Saw Table	3
Testing Locomotive Boilers	3
Uncle Peter's Remarks. Reported by "The Baby."	4
Standard Lathe Tools	4
Hyde's Bench Centering Machine	4
Steam Progress	4
Boring Bars	5
Letters From Practical Men—Faults in Engine Lathes—Machine Foundations and Lathe Fixtures—Stationary Engineers' Organization—Efficiency of Turbines as Affected by Form of Gates—Standard Sizes—The Metric System—Automatic Cut-off and Slide-Valve Engines	5-6-7
Protection and Wages	8
Inventors and Patents	8
Literary Notes	8
Questions and Answers	8
Manufactures	9
Machinists' and Engineers' Supplies	10
Iron and Metal Review	10

Protection and Wages.

As the whole question of revising and remodeling the tariff is now before Congress, and therefore before the people, every available argument will be employed by the enemies of protection to secure all the reduction possible. The revision will so intimately affect nearly every productive industry in the United States that neither workmen nor manufacturers can look upon it with indifference. One of the strongest arguments for maintaining our protective tariff has been that it insures remunerative wages to workmen—higher than in foreign countries for the same kind of service. The free traders would have but a feeble hold upon popular sympathy were they to make no efforts to combat this argument. With much vigor, therefore, do they contend that the higher rates of wages paid in this country are to be ascribed mainly, if not wholly, to other causes than the tariff. In support of this they seize upon every particular development in specially protected industries that may seem to help their position. They endeavor to persuade the public that protective duties only benefit a few favored manufacturers. No other industry in the United States is more indebted to the tariff for its progress and prosperity than the manufacture of iron and steel. It is believed that if it were not for a protective tariff we would still be importing most of our iron and steel from England. Since the beginning of the depression in the iron and steel trade, much interest has been felt in watching how far the manufacturers are disposed to protect the wages of their operatives. Recently we quoted a paragraph from the official *Bulletin* of the iron and steel manufacturers, to the effect that, considering the depression in the iron trade, wages would be cut down. It is hoped that mill and furnace proprietors will not so greatly strengthen the hands of free traders as to refuse moderate and reasonable concessions—even some sacrifices—to their employes, rather than have them suffer large reductions this winter, when the cost of living is extra high.

Figures have recently been published which go to show that wages in the iron and steel mills of England are not greatly below what are paid in many parts of our own country for the same kind of work.

In order to be satisfactory and permanent, the benefits of protection must be fairly distributed. The iron and steel manufacturers have enjoyed a few years of prosperity, and should now be in position to protect their workmen through any ordinary season of depression.

Inventors and Patents.

Judged by what seems to be current opinion, it would be inferred that the failures of inventors, at least of those who secure their inventions through the operation of the patent laws, were phenomenal. Why of all men who invest means—sometimes foolishly—the inventor in a patent should be singled out to point a moral, is a matter by no means plain. Unquestionably, if all patents issued from the Patent Office are looked upon as evidences of so many attempts to establish a business enterprise on the basis of their existence, a large proportion of failures to get rich can be chronicled, but even then hardly more than could be found in other business enterprises. If the same argument that is applied so flippantly to the patentee's affairs is applied in *the same way* to general business affairs, the scope of the inquiry into the cause of the lack of success will be widened to an extent, apparently, not thought of.

But it is manifestly unfair to look at best upon more than a very small per cent. of the total number of patents issued as evidence of an intention to establish a business or accumulate a fortune by their means. The great majority of patentees risk the small amount necessary to obtain a patent exactly as they risk similar amounts in other side or collateral issues, that is for the chance of getting back more than they invest, and fully comprehending the probability of failure. Looked at in this light the failures are about as numerous in one instance as in the other, but in one case they go upon record, while in the other they are unknown. A good many men can look back to a few dollars invested—sunk—in the Patent Office, and at the same time can contemplate several other enterprises that were balanced by profit and loss.

It is sometimes noted as remarkable that so many who know substantially nothing of the matter at issue attempt to improve existing appliances, and undoubtedly a large per cent. of the failure of patented devices to come to the surface the second time is due to this cause, but why this should be considered more remarkable than the fact that men are forever meddling with other things with which lack of acquaintance makes success at least highly improbable, no one can tell.

If in distinction from those who invest a little in patents in the way of their regular business, or who do a little in that way as a sort of side issue, the class that may be termed professional inventors be taken in comparison with those engaged in other business affairs, it will be found that both classes are subject to the same general laws of business, and about the same ratio and degree of success and failure will appear.

Individual judgment is likely to be at fault, or one is likely to invest unadvisedly in securing a patent exactly as in a hundred other ways, and the results will be in accordance with the quality of the judgment, but the idea that there is anything phenomenal in the failure of inventors is something for which it would be difficult to find any foundation.

Much to the purpose, in view of the breaking of the beam strap of the ferryboat Baltimore, of the Pennsylvania Railroad, and the resulting damage to the machinery—the break occurring at an imperfect weld—is the remark of one of our most successful engineers, that in his specifications for similar work he always calls for the strap to be made with only two welds, and these diagonally at the ends. At these points the strap not only has a good hold on the metal, but in the event of its parting, through poor workmanship—a contingency that cannot always be provided against—each part of the strap has still a hold on the upper and lower surfaces of the beam, that may undoubtedly prevent further accident.

We publish, on page 5, three communications with reference to a boring bar, described by Geo. B. Foote in our issue of December 2. The mistake seems, in some instances, to be made of supposing that Mr. Foote claims as novel the throwing to one side one center of a boring bar, for the purpose of boring a taper hole. We understand that all the claim he makes to novelty is in the manner employed to adjust the center, and particularly in the employment of balls and sockets in the head and end of the bar. Furthermore, we supposed it to be well known that such boring bars had been extensively used, especially in jobbing shops, for years. We are acquainted with one shop where, perhaps, a dozen of them may be seen.

We are pained to learn of the death, after a brief illness, of Robert Johnston, 2d, treasurer of the Cohoes Iron Foundry and Machine Company, Cohoes, N. Y. The sad event occurred at Cohoes, on Monday, December 4th, 1882. Mr. Johnston, though a very young man, occupied a very responsible and difficult position in the management of a large establishment, for which his genial temperament and well-balanced mind amply fitted him. His untimely death will be deplored by all who knew him.

In several of our late issues the practical correspondents of the AMERICAN MACHINIST have given more than the usual attention to the discussion of matters connected with machine tool construction. This is really one of the most important matters connected with the machine business at the present day, and tool builders may, perhaps, profitably give attention to the expressions of the men who operate their tools.

Literary Notes.

THE PRACTICAL ENGINEER'S GUIDE, in the Design, Construction and Management of American stationary, portable and steam fire engines, steam pumps, boilers, injectors, governors, indicators, pistons and rings, safety-valves and steam gauges. For the use of engineers, firemen and steam users. By Emory Edwards, Mechanical Engineer, Second Edition illustrated by 119 engravings, 420 printed pages. Published by Henry Carey Baird & Co., 810 Walnut street, Philadelphia, Pa. Price, $2.50.

In preparing the matter composing the book bearing the above title, the author has aimed chiefly to produce a practical book of reference and study for those who have charge of stationary and portable engines. Theory, so far as intricate algebraic formulæ are concerned, has been left out, and only such matter used as would be of practical use to those having charge of steam engines and boilers. A careful perusal of the book is well calculated to aid such individuals, and raise them above the mere position of a "starter and stopper." It is intended as an elementary treatise for those who are beginning to climb the ladder. The catechism system of question and answer has been extensively employed in the preparation of portions of this book, by the aid of which those who wish can better commit its contents to their memory. American types of steam engines, boilers, pumps, and other appliances for steam engines that are commonly used, are fully described. In mentioning the various pieces of apparatus, described with appropriate illustrations, the author seems to have inclined rather too much towards the specialties of one or more manufacturers.

There are some appliances used in connection with steam engines, and for sale in the market, that are more meritorious than some of those mentioned in connection with the engravings. The practical notes are valuable, consisting of rules for horse power, speed of pulleys, rod straps, gibs and keys, oils, and other useful directions for the care and management of steam engines and boilers. The book is well printed and indexed.

AMERICAN FOUNDRY PRACTICE, treating of loam, dry sand and green sand moulding, and containing a practical treatise upon the management of cupolas and the melting of iron. By Thomas D. West. Illustrated by numerous engravings. Price $2.50. Published by John Wiley & Sons, 15 Astor Place, New York.

The author of the above book has been well known to the readers of the AMERICAN MACHINIST for the past two years as a practical writer upon foundry practice. Being a foundry foreman, with an extensive experience in various foundries in several States of the Union, he is well calculated to give that class of information most valuable to American moulders and foundrymen. The book contains 391 pages of practical matter, relating to the various processes and wrinkles in moulding in different kinds of sand and of moulding a variety of articles and parts of machinery without patterns. The substance of most of the chapters that compose this book has been published from time to time in the AMERICAN MACHINIST, but important additions have been made since that time, which add very much to their practical value. The first chapter very clearly sets forth the qualifications of a good moulder, and vividly describes the responsibilities and discretion necessary in his attempts to produce perfect castings. The apprentices will appreciate the chapter on "Learning the Moulders' Trade," as it contains a large amount of good practical advice. The "One Hundred Items that Apprentices Should Know and Remember" alone are worth the price of the whole book. The book contains explicit rules and directions for blacking mixtures for different kinds of moulding, loam mixtures, dry sand mixtures, core sand mixtures, green sand facings, cleaning castings. In addition are given rules for ascertaining the weight of iron required to make castings from measurements taken from the patterns. To facilitate these calculations tables are given where possible. The book is clearly printed and neatly bound. It is

not written with a special view to instructing apprentices, but as a hand-book *for men who have learned the trade.*

The publisher and proprietor of the *Sanitary Engineer*, of this city, has a large share of a quality sometimes lacking in newspaper men, viz., modesty. In the first number of the sixth volume (December 7, 1882), he places his name in his paper for the first time and says favorable circumstances have enabled him to retire from the care of other active interests and he hopes in the future to be able to devote his time and thought to the journal which he has founded. That gentleman, Henry C. Meyer, has, we believe, done more to expose to public attention, "skin" jobs in plumbing, ventilation, drainage, steam fitting and the like, than anyone else in the United States. Every issue of the *Sanitary Engineer* calls attention to jobs that cause great danger to health. Their exposure leads to correction and reform in this particular.

QUESTIONS & ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

(454) G. W. K., Reading, Pa., asks: How is a galvanic battery made, and what chemicals are used? *A.*—Consult any work on natural philosophy.

(455) J. G. W., Dunkirk, N. Y., writes: If I take a boiler with a cylinder attached and place on scales, so that by admitting steam from the boiler to the cylinder the piston will push down on the scales, will the scales register any more weight than the dead weight of the parts? *A.*—No.

(456) F. A., Brooklyn, N. Y., asks: 1. What is asbestos and where is it found? *A.*—Asbestos is a mineral, a variety of hornblende and pyroxene, and is found in various parts of this country and to some extent in nearly all countries. 2. Is ⅛″ gas-pipe 26 or 27 threads to the inch? *A.*—27.

(457) J. W. H., Springfield, Ohio, writes: I notice that on warm days carpenters usually take pains to lay their saws and chisels in the shade. Is the heat of the sun sufficient to draw the temper of such tools? *A.*—There is an opinion amongst some that continued exposure to the sun's heat will lower the temper of cutting tools. Our opinion is that it will not.

(458) W. I. M., Red Oak, Nev., asks: What is a high and what is a low pressure engine? *A.*—As the terms are commonly used a high pressure engine is one in which the steam is exhausted into or against the pressure of the atmosphere, and a low pressure engine one in which the steam is exhausted into a condenser, from which the pressure is removed by an air-pump, or some equivalent device.

(459) G. S. G., Cochran, Ind., writes: I have two engines, each 14″×36″, connected to one shaft, making 60 revolutions per minute. The piston rod is 3″ diameter, and the steam pipe 5″ diameter and 15 feet long. The cut-off is at ¾ stroke; what is the horse power of both engines, and what the horse power of one? *A.*—Horse power of both engines about 100 effective; horse power of one, 50.

(460) J. S., Noel, Iowa., asks: 1. What size horizontal tubular boiler and how many 2″ tubes shall I use for an engine 2″ bore and 1½″ stroke, to run 500 revolutions; steam pressure 40 pounds? *A.*–So small a horizontal boiler is not likely to be entirely satisfactory. You can make one 13 inches diameter, 5 feet long, with 5 tubes. 2. What should be the dimensions of ports and valve? *A.*—Steam ports 3-16″×1½″; exhaust ports ⅜″×1½″; steam lap 3-32″; exhaust lap 0; travel of valve ⅝″.

(461) H., Ottumwa, Iowa, asks: What horse power will a 4-ply rubber belt transmit, running from a 44″ pulley 120 revolutions per minute, the belt being as tight as it will stand without tearing? *A.*–There are so many conditions that influence the power a belt will transmit that nothing can be told with any degree of certainty without knowing them all. For instance, the kind of pulleys, and the size of the pulley the belt runs to. If iron pulleys and both 44″ in diameter, it would probably be possible to transmit, for a short time, 25 horse power under the circumstances named, but such a belt should be used to transmit, constantly, only about 15 horse power.

(462) E. G. F., Branford, Conn., asks: 1. Please to inform me how to case-harden wrought or malleable iron in a tight box? *A.*—Make an iron box and put the articles to be case-hardened in it, together with bone dust, fasten the cover on and lute all cracks with fire-clay. Then submit the whole to a red heat from 1 to 4 hours, according to the size of the articles and the depth you wish them to be hardened. Remove the box from the fire and turn the contents into clear cold water, without exposing to the air. The color of the articles will be variegated. Instead of bone dust you can use saltpeter and leather scraps, in the proportion of 8 pounds of the latter to one of the former. Pack the articles to be hardened so they will not come in contact with the sides of the box. 2. In hardening with potash is salt and ammonia in the water of any use? *A.*—We have never tried either, but perhaps salt may be of a little service.

(463) I. L., Chicago, Ill., asks: Is a boiler 48″ diameter and 14 feet long, boiler pressure 80 lbs., a 50 horse power boiler? *A.*—It is rather small, but if well set with a chimney affording a good draught it will probably furnish steam to run a first-class 50 horse power engine. 2. How much water per hour will be required to supply 100 horse power at 80 pounds steam pressure? *A.*—With a good non-condensing engine about 325 gallons. 3. Is it best to use a mud drum on the boiler? *A.*—We should say no. 4. Where is it best to take the feed water into the boiler? *A.*—A very good plan is to introduce the feed through a perforated pipe near the surface of the water in the boiler. 5. In setting a boiler is it best to let the lugs rest on the brick work, or on plates? *A.*—Set cast iron plates 1″ thick and somewhat longer than the width of the lugs in the wall; let the lugs at the front end of boiler rest on these plates, and between each of the other lugs and plates place rollers, which may be pieces of 1″ round iron. This will allow the boiler to expand and contract freely, without tearing down the wall. 6. Are three lugs on a side sufficient to hold the entire weight of the boiler? *A.*—Yes. 7. I am thinking of constructing an evaporator, with headers 7 feet long and not less than 4″ diameter. The pipes connecting them will be 1½ inches in diameter, and will be placed as close together as they can be screwed in right and left handed. The steam pressure will be 80 pounds let into all the pipes simultaneously. The juice, previously heated to 150° will be let in to cover the pipes, and heat them to that temperature gradually. The question is whether the steam by heating the pipes unevenly will cause them to leak? *A.*—We think if you were to let steam in suddenly there would be danger of causing a leak, but probably by letting it in gradually you may overcome the difficulty.

BUSINESS SPECIALS.

Transient Advertisements, 50 cts. a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

C. M. Morse, Mech. Engineer, 132 Nassau St., N.Y.

F. Samuelson, Pattern Maker, 38 Gold St., N. Y.

James W. See, Consulting Engineer, Hamilton, O.

Steel Name Stamps, &c. J. B. Roney, Lynn, Mass.

Portable Forges, $10. Holt M'f'g Co., Cleveland, O.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N.J.

Latest and best books on Steam Engineering. Send stamp for Catalogue. F. Keppy, Bridgeport, Ct.

J. M. Badger, Expert and Commission Dealer in Machinery, 5 Dey Street, New York.

J. C. Hoadley, Engineer and Expert, 29 High St., cor. Federal, Boston, Mass.

Wood Engraving done in best manner. Designs furnished. Edward Sears, 48 Beekman St. New York.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Foot Power Machinery, for workshop use, sent on trial if desired. W.F. & John Barnes, Rockford, Ill.

Pattern and Brand Letters. Vanderburgh, Wells & Co., corner Fulton and Dutch streets, New York.

Steel Name Stamps, 15 cents per letter, Steel Figures, $1 per set. W. G. Sackmann, 59 Vine St., Cleveland, O.

Light and fine interchangeable machinery to order. Foot and power lathes, slide rests, &c. Catalogue for stamp. Edwd. O. Chase, Newark, N.J.

A lot of 25″ lathes designed to equal the best Philadelphia tools, will soon be ready for delivery. Ohl & Co., E. Newark, N. J

Engine Lathes, Speed Lathes, Foot Lathes, Upright Drills, Light Drilling Machines and other fine tools, Frasse & Co., 62 Chatham St., N. Y.

A handsome monthly journal sent free to engineers and mechanics the year round. Send postal for it to Money Saver, 95 Liberty street, New York.

Christmas Present—"The Complete Practical Machinist," by Joshua Rose, 440 pages, 196 illustrations. $2.50 postpaid. Address, P. O. Box 3306, New York City.

Boring Bars made all sizes for all purposes to bore both straight and taper work. Pedrick & Ayer, proprietors, L. B. Flanders' Machine Works, 1025 Hamilton street, Philadelphia, Pa.

Lyman's Universal Screw Cutting Index and Rule for Compound Gearing, Price. 10 cents. Plain and Practical. Can be used by any one who can do simple multiplication. E Lyman, C. E, New Haven, Ct.

"How to Keep Boilers Clean," and other useful information for steam users and engineers. Book sent free by the publisher, Jas. F. Hotchkiss, 84 John street, New York. Mention this paper.

L. V. Conover, Iron Founder, 336 to 340 East 29th Street, New York. Heavy and Fine Castings of Iron, Brass, Composition and Copper made to order at shortest notice.

Russell & Struthers, Wax Process for making outline engravings. Specimens each week in the AMERICAN MACHINIST. We also do Map Engraving with best facilities. Russell & Struthers, 59 Park Place, New York.

Boiler Shop Tools.—Patent Bending Rolls, Boiler Plate Planers, Combined Punch and Shears, Single Punches or Shears of short or very long reach, Horizontal Flange Punches, Double or Single Bar Iron Shears, Radial Drills. Send to Hilles & Jones, Wilmington, Delaware.

The Theoretical and Practical Boiler Maker, 335 pages, and 37 lithograph plates. Published by the author, S. Nicholls, Yorkshire street, Blackpool, England. Mailed on receipt of P.O.O. value $1.83, to Blackpool. See Review, AMERICAN MACHINIST, p. 8, July 22, 1882.

MANUFACTURES.

The Russell Car Wheel & Foundry Works, Detroit, Mich., has completed an addition to its works.

George Gage, Waterford, N. Y., reports business good and orders for lathes coming in well for quick delivery.

West Stoughton, Mass., is to have a rubber shoe factory 140x80 feet, four stories high, to employ 100 hands.

The new Empire Nut Co., Allegheny City, Pa., have started up and placed their product upon the market.

The Portland Co-operative Stove Company, of Biddeford, Me., have voted to become a stock company.

The Old Colony Railroad Shops are to be removed from Boston. Taunton and Brockton are both anxious to have them.

Peet & Keeler have started a Malleable and Gray Iron foundry at Beloit, Wis. They have two buildings 50x80 and 40x60, respectively.

A new brick building, 200 feet long, is in course of erection at Little Falls, N. J., as an addition to the carpet mills of Robert Beattie's Sons.

The Magnetic Manufacturing Company will build its mills on Broad River, South Carolina. The company will have a capital stock of $500,000.

The Mount Savage Locomotive Works, at Mount Savage, Maryland, owned by the Cumberland & Pennsylvania Railroad Company, have increased their capacity.

The Reading (Pa.) Iron Works have reduced the wages of the workmen in their pipe mill 10 to 15 per cent. The market for wrought iron pipe is not in good condition.

The Corliss Safe Manufacturing Company have lately bought a tract of land in Providence, R. I., near their present works, and contemplate putting up a large brick building.

Among other contracts for governors, Robert W. Gardner, Quincy, Ill., has one for 500 from the Northwestern Car and Manufacturing Co., Stillwater, Minn., for use on farm engines.

It is said that the new boiler for the steamer Lewiston, will be the largest boiler ever built in the State of Maine. It will be 16 feet wide, 17 feet long and 21 feet high, and will weigh over 50 tons.

The Hartford Engineering Co., have shipped a 400-horse power Hartford engine, to the State capitol, Albany, N. Y. It is to furnish power for the elevators, electric lighting and ventilating machinery.

The Bridgeport, Conn., Malleable Iron Company's new buildings cover three and a quarter acres, the foundry alone covering an acre. The company expect to move into their new quarters about January 1.

The St. Charles, Mo., Car Works, having a capacity of twenty cars per day, have shut down on account of lack of orders, and discharged 500 men. The superintendent states that the works will resume in January.

The Bass Foundry & Machine Works, at Fort Wayne, Ind., employ 700 men and use 150 tons of iron a day. They have a new machine shop 300x75, two stories, and manufacture steam engines, boilers, railway castings, etc.

Robert King has resigned the position of Master Mechanic of the Western Railroad of Alabama, a position he has held for many years, and will go into the machine business with the Palmetto Iron Works, at Columbia, S. C.

The Pennsylvania Railroad, it is said, will build new car shops at Fort Wayne, Ind., that will equal, if not surpass, those at Altoona, and have a capacity sufficient for building all the cars used on the Pennsylvania system of roads.

The Valley Iron Works, of Appleton, Wis., manufacturers of all kinds of machinery, will soon occupy their new buildings, three in number. Their main building will be 112x20, foundry, 75x50 feet; blacksmith shop, 40 feet square.

The Tullahoma, Tenn., File Works, under the proprietorship of M. R. Campbell, is having such an increase of business that it is found necessary to put up more machinery and engage additional workmen to meet the demand for their goods.

The Cincinnati, New Orleans & Texas Pacific Company contemplate building new shops that will cost $250,000, exclusive of ground and machinery. The engine equipment is soon to be increased by the addition of 10 passenger locomotives with 18x24 cylinders.

Ground has been broken at Pawtucket, R. I., for a three-story building 112x40 feet, with an ell 40x40 feet, and an engine and boiler house. The building is to be erected by the Fales & Jenks Machine Company, and is to be occupied entire by Edwin Jenks and J. E. Jenks, of the firm of E. Jenks & Co., for the manufacture of ring travelers, wire goods, banding, twine, etc., same as is now manufactured by the old firm, with one or two new specialties.

The New York Locomotive Works, Rome, N. Y. are nearly ready to send out their first locomotive. They have eighteen locomotives under way in drawing room and shop. Seven are in course of construction in the shop, four of them passenger, for the Northern Pacific Railroad, and three switch engines for the East Tennessee, Virginia and Georgia Railroad. Orders and inquiries for locomotives are fully up to the capacity of the works to build.

The Griffin Car Wheel Co., the Detroit Car Wheel Co., and the Russel Wheel & Foundry Co., all of Detroit, Mich., are full of orders, and are really hard-pushed to meet the demands of their customers for prompt delivery.

The Oneida Steam Engine and Foundry Company, Oneida, N. Y., are making 16 fifteen inch four-jawed chucks for the Star Tool Company for holding five inch pipe or iron. They are to be used on cutting off machines. Thirty-eight hands are employed in making chucks, and orders are booming.

The town of Annison, Ala., has two furnaces in active operation, belonging to the Woodstock Iron Co., producing 50 tons of car wheel pig iron per day; a cotton mill of 10,700 spindles; a large machine shop, that of Noble Bros., recently removed from Rome, Ga., and a flouring mill. Other industries are in contemplation.

The Minnesota Iron Company has been incorporated at St. Paul, to operate five or six iron mines in the Vermillion Lake iron district. The enterprise also contemplates the construction of 100 miles of railroad from Duluth to this mining region, the charter of the Duluth & Iron Range Railway Company being held by this company.

The capital stock of the Kelly Nail and Iron Company, of Ironton, O., is nearly all subscribed, and active work will soon be begun on the plant. The latter will consist of a coke or stone coal furnace and a nail mill to be erected in or near the vicinity of Ironton. W. D. Kelly & Sons, of Ironton, are largely interested in the enterprise.—*Age of Steel.*

The new Missouri Malleable Iron Co., of St. Louis, will soon be ready for operations. The works are 365 feet long with two wings, each 130 feet long. The mean depth of main building and wings is 70 feet. The foundry is L shaped, one part being 140 and the other 130 feet long; it is 70 feet wide. One hundred and fifty men will be employed.

Pattison, Callender & Co. started a tool and manufacturer's supply store in Dayton, Ohio, two years ago. Their business has grown rapidly and they are now selling goods to parties as far South as Chattanooga, although their trade is limited to retail custom. This is an enterprising firm in an enterprising city.

The Cope & Maxwell Manufacturing Co., Hamilton, O., have one of their Isochronal pumping engines raising 3,000,000 gallons of water per day, and are raising 2,000,000 gallons at Springfield, O., and one having 3,000,000 gallons daily capacity, at Hyde Park, Ill. The city of Pullman, is supplied from the latter engines.

Frank Lederle, agent of the Jarvis Patent Furnace, Atlanta, Ga., has formed a partnership with Mr. T. G. Morgan, and they will continue business under the firm name of Atlanta Engineering Co., making a specialty of the erection of power plants, flouring mills, mining machinery, etc. They are now changing the boilers of two mills in Atlanta to use Jarvis system of burning fuel.

The Stiles & Parker Press Co., Middletown, Conn., are busy on orders, working 80 men. This company have doubled the capacity of their blacksmith shop, and made an addition 16x55 feet to their machine shop during the past year; also added some large machine tools, and contemplate adding others. They are bringing out a new squaring shear for cutting metal plates up to ½″ thick and 50″ wide.

John A. Wilde, 76 Cranberrry street, Brooklyn, N. Y., has had his expanding mandrel (illustrated some time since in the AMERICAN MACHINIST,) submitted to a test by the Bureau of Steam Engineering of the Navy Department. The engineers in charge of the test say: "As the result of long tests of this mandrel on regular work in the machine shop of the New York Navy Yard, we are of opinion that it is an excellent tool for its purpose; accurate, convenient and economical, and that it will give satisfaction wherever used."

Birmingham, Ala., is a city of 11,000 inhabitants, and is fast becoming the Pittsburgh of the South. It is said that within a radius of 8 miles, taking the heart of the city as a center, 6,200 men are employed in furnaces, mills, foundries and machine shops. The two largest concerns are the Sloss and the Alice furnaces, the former turning out 205, and the latter 193 tons of pig iron per day. An immense charcoal furnace is being built by Bardleben & Underwood, which is to be put in blast by the first of January next.—*The Artisan.*

The low state of the water in the Merrimac River is causing much trouble with the mills in Manchester, Lowell and Lawrence. The Western Electric Light Co., of Manchester, have been running their electric lights in that city by water power, but as they fear they will not be able to avail themselves of this power all the time, they have decided to put in auxiliary steam power. They have ordered a Lawrence engine, built by the Builders' Iron Foundry, of Providence. This will be supplied with steam from a new Benzon steel boiler 72″ inches in diameter by 15′ long, manufactured by the Whittier Machine Co. This boiler will be set with the Jarvis furnace to burn screenings and soft coal, using for that purpose the Sheffield grates. The chimney will be an iron stack 75′ high, diameter at base 32″, and 36″ at the top.

Machinists' and Engineers' Supplies.

NEW YORK, Dec. 7, 1882.

Trade in supplies continues quiet, having gradually settled to the usual condition as the holidays approach. The dealers look forward hopefully to the business prospects of next year expecting that it will be satisfactory. Prices continue firm. In some branches they have been cut to the extent that lower figures can hardly be expected.

The Ashcroft Manufacturing Co., 111 Liberty street, New York, have just taken the agency for New York and vicinity for machine tools made by the following parties: Brainard Milling Machine Co., Hyde Park, Mass.; A. W. Powell & Co. Mass.; Wm. Gleason & Co., Rochester, N. Y.; Flathers & Co., Nashua, N. H. A full line will be kept in stock.

Iron and Metal Review.

Business in the Pig Iron market continues quiet and the transactions are principally of small proportions. The recent concessions in prices have had the effect of creating an indifference so that consumers do not feel inclined to buy freely, therefore the volume of business continues unchanged.

We quote prices as follows: Foundry No. 1, $25 to $26. Foundry, No. 2, X, $23. to $24. Grey Forge, $20 to $21.

The supply of Foreign iron continues light and sales are confined to small lots. Contracts for large quantities are obtainable at slightly lower prices than our quotations.

We quote Coltness $26 to $26.75; Glengarnock, $23 to $24; Gartsherrie, $26; Summerlee, $26 to $26.50; Carnbroe, $23.50; Eglinton, $22.50 to $23; Langloan, $26 to $26.50.

The feeling among the manufacturers and consumers of Steel Rails is much better than it has been for several weeks past and the outlook continues to improve.

Copper remains unchanged at 18c. to 18¼c. Banca Tin 28c.; Straits and Malacca 22c. to 22½c.; Billiton 22¼c.; Australian 22c to 22¼c. English Lamb and Flag 22¾c.; Spelter, Common Domestic 4¾c. to 4 8c.; Refined, 8c to 8¾c.; Lead, 4¼c.; Antimony, Hallet's, 10½c. to 10¾c.; Cookson's, 12¼c. to 12¾c.; Nevada 12c.

WANTED

"Situation and Help" Advertisements, 30 cents for each seven words (one line) each insertion. Copy should be sent to reach us not later than Thursday morning for the ensuing week's issue.

Mechanical Draughtsman. Best references, wants engagement. Hufnagel, 64 Nassau st., N. Y. City.

A position wanted by a mechanical draughtsman, graduated from Polytechnic school in Europe, in or around New York. Best references. L. B., 307 East Broadway, New York City.

Want to make contract with some good machine shop to build 9 or more machines, easy to build. Patterns furnished, and man to look after and show about them. Address, A. L., care of AMERICAN MACHINIST.

A situation as foreman by a practical machinist and tool maker, twenty years experience in cheap and ready methods of doing most all kinds of metal work. Can furnish first-class reference. Address, Box 10, care AMERICAN MACHINIST.

Mechanical Draughtsman is open to engagement who is capable to take charge. Excellent references from leading firms. Experienced in electrical dynamos, shop work, sewing machines, special machinery, etc. Address, D., BOX 1, AM. MACHINIST.

Steam Users in want of First-Class Licensed Engineers can be supplied with reliable men. Address, Benj. F. Kelly, No. 20 Cortlandt St., New York. Agent for James Jenks' Duplex Injector and The Baragwanath Steam Jacket Feed Water Heater and Purifier.

A practical mechanic, at present holding a responsible position, will be at liberty January 1st and desires an engagement. Experienced in designing and constructing tools, fixtures, etc., for duplicate and interchangeable work, fine tools machinery, etc. Address, Box 6, care AM. MACHINIST.

Wanted—Situation as foreman moulder by a first-class practical man, many years' experience at the business, accustomed to all kinds of light and heavy work, core making, melting and the construction of patterns. Highest references. Address, Manager, office AMERICAN MACHINIST.

Mechanical Engineer and Draughtsman of over fifteen years' experience, thoroughly conversant with the minutiæ of all departments; competent to design, construct, manage or superintend, will want an engagement shortly. Specialties: Steam pumps and steam machinery. Either opportunity to advance or good salary required. Addresss, Practical, AMERICAN MACHINIST office.

Tool Builder Wanted.—The advertiser, who is building Iron Planers, Lathes and Drills (as well as being engaged in other lines of manufacture) desires to obtain a first-class practical tool builder to take charge of this department. One with some means, who would take an interest in the business preferred; an established business, good market and good prices. Apply for particulars, "Tool Builder," MACHINIST Office.

Competent Superintendent wanted for a new and well appointed Malleable Iron Works, doing all kinds of work such as usually done in machine shops, malleable and gray iron works. Must understand thoroughly the mixing of irons, annealing, pattern making, core making, etc., and be able to take charge of all departments, each having a competent foreman. Address, Iron, care AMERICAN MACHINIST.

Large tools wanted—30 ft. Pit lathe, also large planer 6 or 7 ft. square, to plane at least 24 ft. Send prices and quickest delivery, M. C. Bullock Manufacturing Co., 80 to 88 Market St., Chicago, Ill.

We want a good salesman to represent us in outlying territory on commission. Will send goods on trial—thoroughly established. Large Commission, office AMERICAN MACHINIST.

Wanted—$50,000 or $25,000 to begin the manufacture of several machines of recognized merit (secured by patents), or parties having a first-class machine shop, with facilities for employing 100 hands, wishing to secure the manufacture of standard machines, will please address, Manufacture, care AMERICAN MACHINIST.

Print Your Own Cards &c. Press $3

Large sizes for circulars, &c. $8 to $90. For pleasure, money making, young or old. Everything easy, printed instructions. Send 2 stamps for Catalogue of Presses, Type, Cards, &c. to the factory

Kelsey & Co., Meriden, Conn.

FOR SALE!

Opportunity for a Practical Mechanic

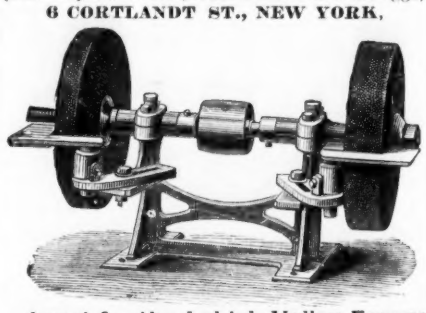
A Machine and Wood-Working Shop, located in St. Louis, Mo. Making machinery of rapid sale at good profit. An investment of $8000 can be made to yield $5000 a year. To be sold on account of ill-health.

Address, N. W. AYER & SON, Philadelphia, Pa.

COOKE & CO.

(Formerly Wm. Cooke, successor to Cooke & Beggs)

6 CORTLANDT ST., NEW YORK.



Agent for the Lehigh Valley Emery Wheels & Emery Wheel Machinery.

Our wheels possess superior cutting qualities, combined with great durability. Eureka Plow Polisher and Patent Stove Plate Grinders.

BOURDON STEAM GAUGE WITH LANE'S IMPROVEMENT.

ORIGINAL Steam Gauge Co.

Bus. Estab. in 1851. Incorporated in 1854.

IMPROVED Thompson's Indicators

AMSLER'S POLAR PLANIMETER, AND THE PANTOGRAPH.

AMERICAN STEAM GAUGE CO.,

Sole Manufacturers,

36 Chardon Street, Boston, Mass.

Send for New Illustrated Price List and name this paper.

J. C. BLAISDELL, Pres.

E. BURT PHILLIPS, Treas. H. K. MOORE, Sup't

H.W. JOHNS' ASBESTOS STEAM PACKING

Boiler Coverings, Millboard, Roofing, Building Felt, Liquid Paints, Etc.

DESCRIPTIVE PRICE LIST AND SAMPLES SENT FREE.

H. W. JOHNS MFG. CO., 87 Maiden Lane, N. Y.

Mechanical Drawing Without a Teacher.

Prof. S. E. Warren's Elementary and Higher Works are full and sufficient in Theory and Practice, and have long been used by Scientific Schools, Draughtsmen and Self-Instructors.

An inquiring student recently told the author that he found in the

Drafting Instruments and Operations, 12mo., $1.25 and **Elementary Projective Drawing**, 12mo., $1.50, just the information and explanations he needed with the Elementary Perspective, 12mo., $1 00. The above followed by

Warren's Descriptive Geometry, 8vo.....$3.50
" **Machine Drawing**, 2 vols., 8vo...$7.50
and " **Stone Cutting**, 8vo $2.50

are perfectly adapted to all practical Mechanics, Carpenters, Railroad and other Machinists, Masons, Engineers, Architects and Builders.

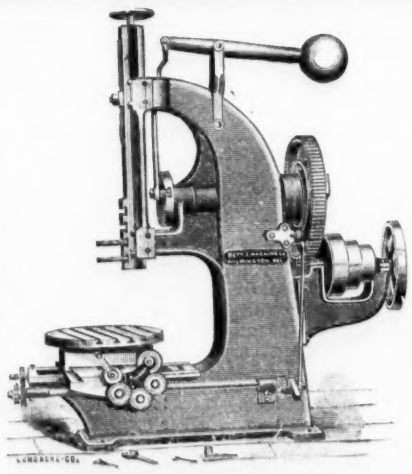
Published and for sale by

JOHN WILEY & SONS,

15 Astor Place, New York.

And may be procured of all leading Booksellers.

Descriptive circulars, catalogues, &c. free by mail.

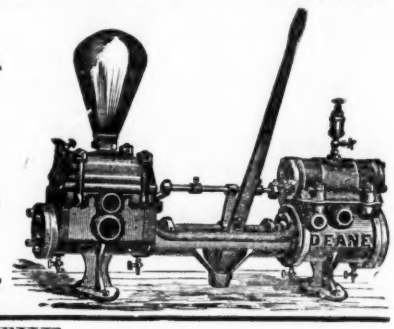


BETTS MACHINE CO.,

MACHINE TOOL BUILDERS,

WILMINGTON, DEL.

"THE DEANE" STEAM PUMPS FOR EVERY SERVICE.



Send for New Illustrated Catalogue.

—:o:—

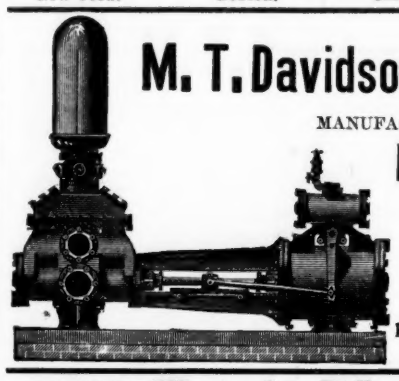
The Deane Steam Pump Co.

HOLYOKE, MASS.

92 & 94 Liberty St., New York. 54 Oliver St. Boston. 226 & 228 Lake St., Chicago.

THE

M. T. Davidson Improved Steam Pump,



MANUFACTURED BY

Davidson Steam Pump Co.,

OFFICE & WORKS:

41 to 47 KEAP STREET, BROOKLYN, N. Y.

Warranted the Best Pump made for all Situations.

KELLY & LUDWIG, Agents, 49 and 51 North 7th St., Phila., 97 Liberty Street., New York.

Weston's Differential Pulley Blocks,

CAPACITIES FROM ⅛ TON TO 10 TONS.

ONE MAN CAN LIFT 5,000 POUNDS.

THEY HOLD THE LOAD SUSPENDED AT ANY POINT.

ALL SIZES IN STOCK.

THE YALE LOCK MFG. CO.

Manufacturers, Engineers and Machinists,

PRINCIPAL OFFICE AND WORKS, STAMFORD, CONN.

SOLE MAKERS.

SALESROOMS:

NEW YORK—53 Chambers St. PHILADA.—507 Market St.

BOSTON—224 Franklin St. CHICAGO—64 Lake St.

40 page Catalogue of Light Hoisting Machinery furnished on application.

DIRECT BLOCK. GEARED BLOCK

THE CAMERON STEAM PUMP

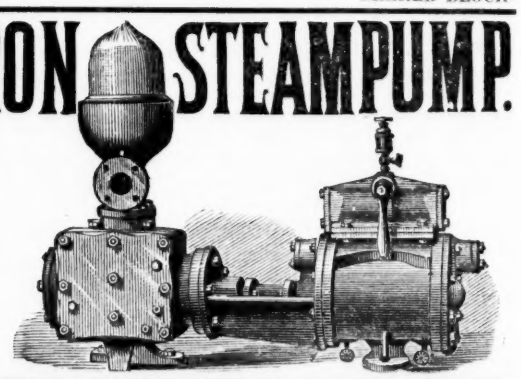
Is the Standard of Excellence

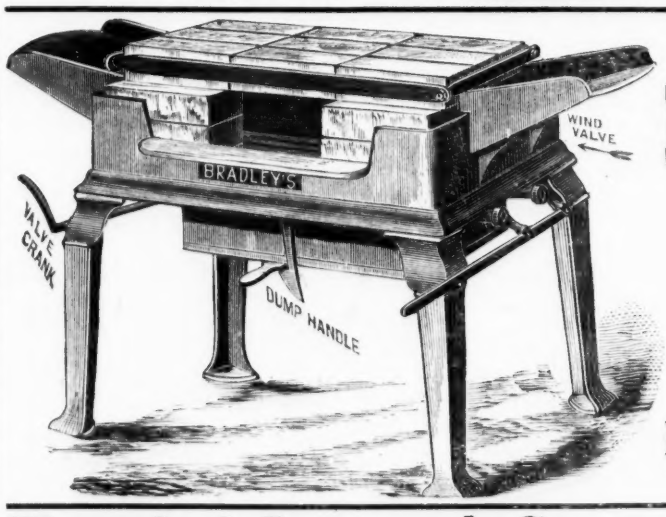
AT HOME AND ABROAD.

THE A. S. CAMERON

STEAM PUMP WORKS,

Foot of East 23d Street, New York.





BRADLEY'S Heating Forges

For Coal or Coke.

Established 1832.

BRADLEY & CO.,

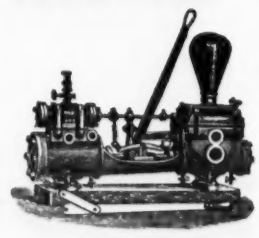
SYRACUSE, N. Y.

Knowles' Improved Steam Pumps,

THE STANDARD

Steam Pumps for Every Possible Service.

SEND FOR ILLUSTRATED CATALOGUE.



KNOWLES STEAM PUMP WORKS,

86 Liberty Street, NEW YORK. | *44 Washington Street,* BOSTON.

NICHOLSON FILE CO.,

SOLE MANUFACTURERS OF

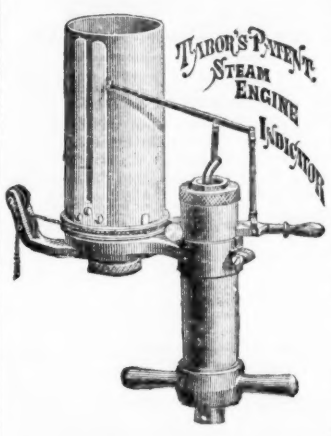
FILES AND RASPS

HAVING THE INCREMENT CUT.

Also, FILERS' TOOLS AND SPECIALTIES.

"Nicholson File Co's" Files and Rasps, "Double Ender" Saw Files, "Slim" Saw Files, "Bacer" Horse Rasps, Handled Rifflers, Machinists' Scrapers, File Brushes, File Cards, Surface File Holders, Vise File Holders, Stub Files and Holders, Improved Butchers' Steels

Manufactory and Offices at **PROVIDENCE, R. I.- U. S. A.**



ESTABLISHED 1851.

The Ashcroft Manufacturing Co.

Successors to E. H. ASHCROFT,

"Original Steam Gauge Works."

THE E. H. ASHCROFT

Improved "Bourdon" Steam Gauges.

Sole Owners and Manufacturers of

TABOR'S PATENT

STEAM ENGINE INDICATORS,

Specially adapted to

Indicating High Speed Engines and Locomotives.

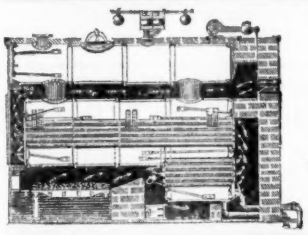
STEAM and WATER GAUGES,

Railway, Steamship and Machinery Supplies.

111 Liberty Street, New York.

Factories, BOSTON & LYNN.

E. L. MAXWELL, Prest. H. S. MANNING, Treas.
CHAS. A. MOORE, V-Prest. MARTIN LUSCOMB, Sec'y.



WM. T. BATE & SON,

CONSHOHOCKEN, PENNA.

Manufacturers of

Bate's Patent Steam Generator.

THE MOST ECONOMICAL, RELIABLE AND DURABLE.

A large number of these boilers in use in the best establishments and institutions, showing **Splendid Results** in the way of economy, efficiency, durability and convenience of cleaning. We refer to parties using. Write for particulars.

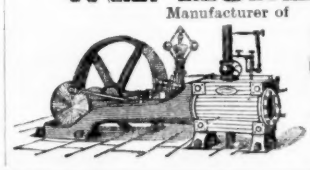
SHEPARD'S CELEBRATED
$60 Screw Cutting Foot Lathe.

Foot and Power Lathes, Drill Presses, Scrolls, Saw Attachments, Chucks, Mandrels, Twist Drills, Dogs, Calipers, "Sun Light" Gas Machines, etc. Send for catalogue of outfits for amateurs or artisans. Address

H. L. SHEPARD & CO.,
341 & 343 WEST FRONT STREET,
CINCINNATI, OHIO.

WM. MÜNZER,

Manufacturer of



IMPROVED CORLISS ENGINE.

1st Av. cor. 39th St. New York.

AKRON IRON COMPANY,

AKRON, O.

PATENT HOT POLISHED SHAFTING.

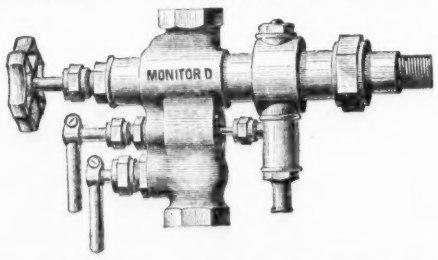
Superior to any shafting in market for the following reasons, viz.: 1st.—It is perfectly straight and round. 2d.—It can be rolled accurately to any desired gauge. 3d.—It has the beautiful blue finish of Russia Sheet Iron, rendering it less liable to rust or tarnish than shafting of the ordinary finish. 4th.—It will NOT SPRING or WARP IN KEY SEATING like most of the other manufactured shafting sold in the market, and, as a consequence, is admirably adapted for LINE AND COUNTER SHAFTING. 5th.—The surface is composed of MAGNETIC OXIDE OF IRON, forming a superior journal or bearing surface. 6th.—It is made of superior stock.

Sizes made from 7/8 to 3 15/16 inches, advancing by sixteenths. Price lists, with references and other information, furnished on application to

AKRON IRON CO., Akron, O., Sole Manuf'rs.

Or **E. P. BULLARD, 14 Dey Street, New York,** General Eastern Agent.

THE "MONITOR."



A NEW LIFTING & NON-LIFTING INJECTOR.

BEST BOILER FEEDERS IN THE WORLD.

FRIEDMANN'S

Patent Ejectors,

OR

WATER ELEVATORS,

For Conveying Water and Liquids.

Pat. Oilers & Lubricators, &c.

NATHAN & DREYFUS,

Patentees and Manufacturers,

92 and 94 Liberty Street,

NEW YORK.

Send for Illustrated Catalogue.

IMPROVED HOISTING ENGINES

Manufactured by the

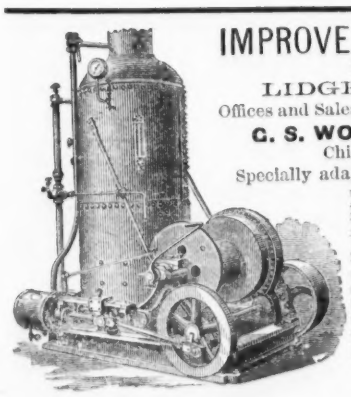
LIDGERWOOD MF'G CO.

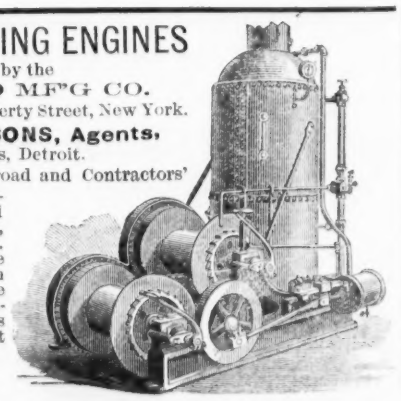
Offices and Salesrooms: 96 Liberty Street, New York.

C. S. WORMER & SONS, Agents,

Chicago, St. Louis, Detroit.

Specially adapted for Railroad and Contractors' uses, Pile-driving, Bridge and Dock Building, Excavating, &c. Single or double cylinders with single or double improved friction drums with or without Boilers.





ALL SIZES.

TRUMP CHUCK.

A Self-Centering Three-Jawed Steel Chuck for Small Drills.

Carefully made, Accurate, Durable, and Convenient. The jaws have a good bearing on the drill, and hold securely either straight or taper shanks. They are made on solid steel plug centered and readily fitted to Lathe or Drill Press.

The 1-8 Chuck, for Drills 1-8 and under, Price, $1.50
" 1-4 " " " 1-4 " " 2.50

By mail, postage, 4 and 8 cents.

TRUMP BROS. MACHINE CO., Manufacturers, Wilmington, Del., U. S. A.

WORCESTER MACHINE SCREW CO.

AND 111 LIBERTY ST NEW YORK

MANUFACTURERS OF

STANDARD MACHINE SCREWS.

TOOLS.

Machinists, Engineers, Model Makers and all classes of Mechanics can find TOOLS to suit them at

184 to 188 WASHINGTON STREET, BOSTON, MASS.

A. J. WILKINSON & CO.

CATALOGUES FREE.

C. W. LE COUNT, South Norwalk, Conn.

This dog is very heavy, and is warranted not to break with any work

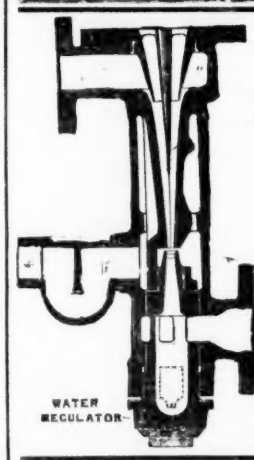
No 1	3-8 in	$	.50
" 2	1-2 "		.60
" 3	7-8 "		.70
" 4	3-4 "		.70
" 5	7-8 "		.80
" 6	1 "		.80
" 7	1 1-8 "		.95
" 8	1 1-4 "		.95
" 9	1 3-8 "		1.10
" 10	1 1-2 "		1.10
" 11	1 3-4 "		1.25
" 12	2 "		1.40
" 13	2 1-4 "		1.60
" 14	2 1-2 "		1.60
" 15	3 "		1.80
" 16	3 1-2 "		2.60
" 17	4 "		2.30
" 18	4 1-2 "		3.00
" 19	5 "		3.50
Full set, 19 Dogs,			26.35
No. 20	5 1-2 in		4.25
" 21	6 "		5.00

Small set of 8 dogs from 3-8 to 2 ins., $7.30.
No. 14 2 1-2 in., $4.60
" 15 3 " 1.70
" 16 3 1-2 " 2.00
" 17 4 " 2.30
Set of 12 from 7-8 to 4 inches, $15.00.

When ordering, state as above, whether a full set or a set of 12 or smallest of 8. Either of these dogs perfect fit in tools any other maker's.

LE COUNT'S HEAVY STEEL DOG,

With Steel Screws. Lathe Made and Hardened.



ESTABLISHED 1850.

SCHAFFER & BUDENBERG,

NEW INJECTOR

Worked by Exhaust Steam Alone.

Takes the place of Feed Pump, Heater, and by Condensing the Exhaust Steam removes the Back Pressure.

UTILIZES A POWER HERETOFORE THROWN AWAY.

Works automatically at a steam pressure of less than half a pound. Adapted to all pressures.

For LOCOMOTIVES as well as STATIONARY ENGINES.

WORKS AT BUCKAU,—GERMANY.

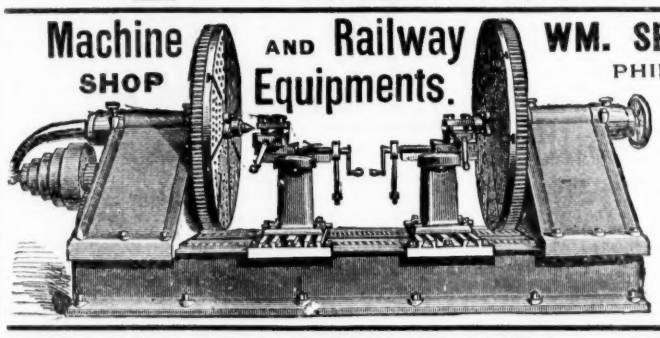
DEPOT GENERAL OF THE UNITED STATES,

W. HEUERMANN, 40 JOHN STREET, NEW YORK.

Machine SHOP AND Railway Equipments.

WM. SELLERS & CO.

PHILADELPHIA.



Shafts, Couplings, Hangers, Pulleys, Mill Gearing, etc., Lathes, Planers, Drills, Shapers, Bolt Cutters, Twedell's Hydraulic Riveters, etc. Railway Turntables and Pivot Bridges. Gifford Injectors, Sellers' Improvements, New Patterns. Simple. Effective.

New York Office,
79 LIBERTY ST.

REVOLVING HEAD SCREW MACHINES — WITH PATENT AUTOMATIC WIRE FEED.

Of Extra Strength and Power, of a Superior Design and Finish.

WICACO SCREW & MACHINE WORKS, 712 Cherry St., Philadelphia, Penn.

THE HENDEY MACHINE CO.

TORRINGTON, CONN.

15, 24 and 30 in. Shapers.

4 ft. x 16 in., 5 ft. x 20 in., 6 ft. x 24 in., 6 ft. x 26 in., 8 ft. x 26 in. and 8, 10, and 12 ft. x 30 in. Planers.

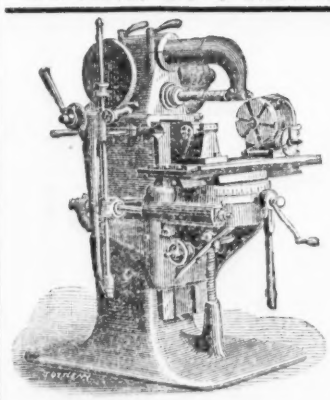
5 ft. x 12 in., 6 ft. x 12 in., 6 ft. x 15 in. and 8 ft. x 15 in. Hollow Spindle Hand Lathes.

AMATEURS' HAND PLANERS, SHAPER AND PLANER CENTERS, SLIDE RESTS, &c.

CHARLES MURRAY

ENGRAVER ON WOOD

58 ANN ST. NEW YORK.



New Heavy Universal Milling Machine.

Correspondence solicited.

MANUFACTURED BY

C. E. LIPE, Syracuse, N. Y.

JEROME B. SECOR,

MANUFACTURER OF

Machinery and Tools,

IMPROVED WIRE FEED SCREW MACHINES, GUN AND SEWING MACHINE TOOLS, DIES FOR DRAWING, FORGING, BLANKING, &c., MADE TO ORDER.

Manufacturer of

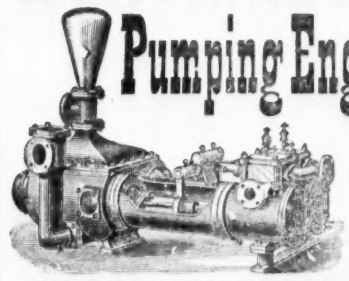
THE SECOR SEWING MACHINE,

Factory Cor. Broad & Railroad Ave.

BRIDGEPORT, CONN.

WORTHINGTON

Pumping Engines



AND STEAM PUMPS.

HENRY R. WORTHINGTON.

239 Broadway, New York.
70 Kilby St., Boston. | 707 Market St., St. Louis

Send for Latest Catalogue.

TESTIMONIAL
ON THE MERITS OF THE
HANCOCK INSPIRATOR.

PITTS AGRICULTURAL WORKS,
BUFFALO, N. Y., April 26, 1882.
THE HANCOCK INSPIRATOR CO.,
BOSTON, MASS.

Gentlemen:

At your solicitation we were induced to make experiments with the Hancock Inspirator on our Traction Engines, for the purpose of testing their reliability for use on the road, and being so well recommended by your agent, Mr. Randall, we, by his suggestion, made the following test, which was even more than we ever expect any engine will be called upon to perform, viz :

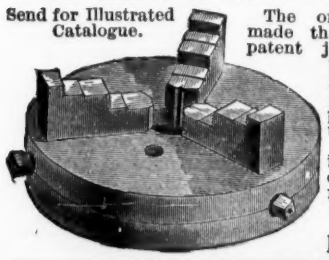
Within a space of fifty feet were placed 6 x 4-inch timber, and alternately, twenty-one pieces of pig iron, on hard ground, over which the engine was propelled four times, without interfering with the operation of the Inspirator; but it performed its duty the same as when the engine was at rest, thereby not only proving the strength of our engine, but also the faithful performance of the Inspirator, under the most adverse circumstances.

We therefore cheerfully recommend its use to all our patrons, and any who are in need of a reliable machine, under all circumstances, for a boiler feeder. We have also placed one on our shop boilers, giving good results and perfect satisfaction.

Yours truly,
LEVI BRONSON, *Superintendent.*
ROBERT W. AITHEN, *Master Mechanic.*

THE E. HORTON & SON CO.
Canal St., Windsor Locks, Conn., U. S. A.
Only Manufacturers of the
HORTON Lathe and Car Wheel CHUCKS.
CAR WHEEL CHUCKS FROM 30 TO 42 INCH.

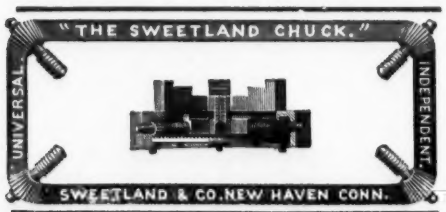
Send for Illustrated Catalogue.



The only chucks made that use the patent jaw, with both face and bite of jaws ground perfectly true.

None genuine without our trade-mark "The Horton Lathe Chuck."

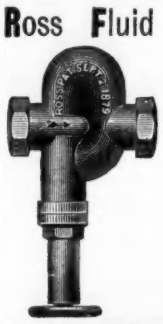
T. NEW'S PREPARED ROOFING.
For steep or flat roofs. Applied by ordinary workmen at one-third the cost of tin. Circulars and samples free. Agents Wanted. T. NEW, 38 John Street, New York.



WOOD-WORKING MACHINERY.
Universal Wood Workers, Planing, Matching, Moulding, Band and Scroll Sawing Machines, Carriage, Wagon and Wheel Machinery, etc.
BENTEL, MARCEDANT & CO.,
HAMILTON, OHIO, U. S. A.

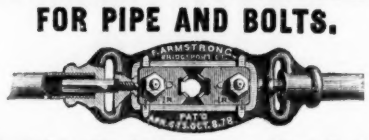
THE GARDNER COMPENSATION GOVERNOR
Unequaled for accuracy, safety, convenience, durability, workmanship, and design. Address
ROBERT W. GARDNER,
QUINCY, ILL.
New York Agents, JAMES BEGGS & CO., No. 9 Dey Street.

Ross Fluid Pressure Reducer,
FOR
Steam, Water, Air and Gas.



Automatically reduces the pressure in pipes to any desired extent.
Manufactured by the
Ross Valve Co.
652 RIVER ST., TROY, N. Y.
Simplest! Cheapest! Best!
Send for Circular.

ARMSTRONG'S IMPROVED ADJUSTABLE STOCK AND DIES FOR PIPE AND BOLTS.

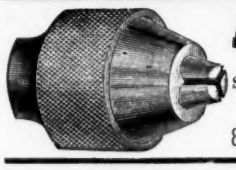


Tapped to Standard Gauges. *Adjustable* to all variations in the size of fittings. Can be *resharpened without drawing the temper* by simply grinding them. Possessing practical advantages appreciated by all mechanics. Circulars sent free on application.

Manufactured by F. ARMSTRONG, Bridgeport, Conn.

THE ALLIGATOR WRENCH,
Patented Aug. 31, 1875.
Teeth cut diagonally. Grips Round Iron or Pipe.

AMERICAN SAW CO.
TRENTON, N. J.



Almond Drill Chuck.
Sold at all Machinists' Supply Stores.
T. R. ALMOND,
84 Pearl St., Brooklyn, N.Y

"PATENT BINDER"
For the AMERICAN MACHINIST holds 53 weekly issues in good shape. Sent to any address by mail for one dollar. **American Machinist Publishing Co.,** 96 Fulton Street, New York.

HOLLAND LUBRICATOR
For lubricating the valves and cylinders of steam engines. Operating with **downward Visible Drop.** The principle of the Lubricator is entirely new, being the only one manufactured operating with a downward visible drop, and does not conflict with any other Patented Lubricator.

Protected with Letters Patent, granted July 5, 1881.

A saving of from 50 to 90 per cent. in cost of oils.

For sale by the Manufac'rs,
Holland & Thompson,
TROY, N. Y.

E. GOULD & EBERHARDT,
97 to 113 N. J. R. R. & AVE., NEWARK, N. J.

New Gear Cutter.

Entirely automatic in all its movements

Will cut all gears without attention. Perfectly accurate. Patent applied for.

HARRISON BOILER. "THE SAFEST"
Adapted for all Steam Purposes.

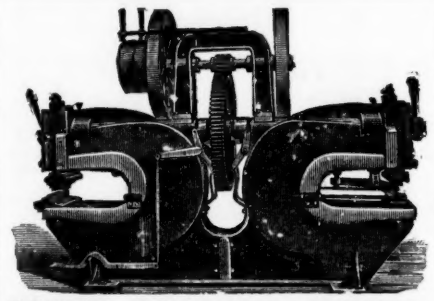
Merits have been proved during **ten to fifteen years constant use** by such concerns as Cheney Bros., South Manchester, Conn.; Wallace & Sons, Ansonia, Conn.; Wampanoag Mills, Weetamoe Mills, Sagamore Mills, Fall River, Mass.; Sears' Building, Boston, Mass.; Brown & Sharpe Mfg. Co., Providence, R. I.; A. T. Stewart & Co., Tiffany & Co., New York; Stevens' Institute, Hoboken, N. J.; Matthiessen & Wiecher's Sugar Refinery, Jersey City, N. J.; Wm. Sellers & Co., S. S. White, Daniel Allen, Jno. Gardiner & Co., Phosphor-Bronze Smelting Co., Henry Bower, Evening Bulletin, Saturday Night, Philadelphia, Pa., and numerous others.

Franklin Institute Medal awarded for SUPERIORITY OF EVAPORATIVE EFFICIENCY, ECONOMICAL CAPACITY FOR GENERATING STEAM AND DYNAMIC VALUE OF STEAM. Easily transported on mule back. Send for Descriptive Catalogue.

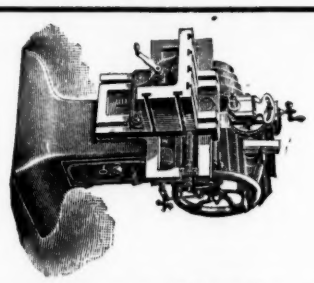
HARRISON BOILER WORKS
Germantown Junction, Philadelphia, Pa.

HOLROYD & CO., Waterford, N. Y.
Manufacturers of STOCKS and DIES.

For MACHINISTS, BLACKSMITHS & GAS FITTERS.



POWER PUNCHES, SHEARS, HAMMERS.
We make over 100 sizes of Punches and Shears, Double and Single, varying from 500 to 36,000 pounds in weight, and adapted for every variety of work The Double machines are equal to two Single ones as each side is worked independently. Also
ADJUSTABLE HELVE CUSHIONED HAMMERS
Of all sizes, unequalled for efficiency and durability.
The Long & Allstatter Co.,
HAMILTON, OHIO.



New Haven Manf'g Co.
NEW HAVEN, CONN.
Lathes, Planers, Drills,

THE Slate Sensitive Drill.
Adapted to rapid work with small drills. Its extreme sensitiveness prevents clogging and breakage of drills. Has a swinging table with attachment for center drilling. Instantly adjustable to different lengths of work. Over 200 already in use. Send for circular
DWIGHT SLATE,
HARTFORD, CONN

PORTABLE and STATIONARY ENGINES And BOILERS,

5 to 25 H. P. Parts duplicate and interchangeable, specially adapted to run Electric Light Machinery. Send for Circular.
SKINNER & WOOD, Erie, Pa.

THE SEIBERT CYLINDER OIL CUP CO.,
53, OLIVER ST., BOSTON.

Sole Manufacturers of **Oil Cups for Locomotives, Marine and Stationary Engine Cylinders,** under the Seibert & Gates Patents, with Sight Feed.

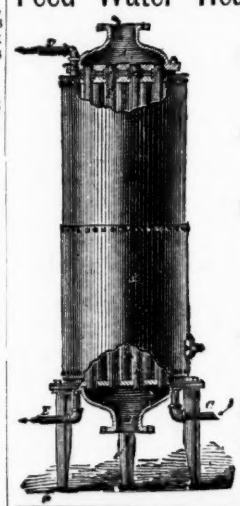
TAKE NOTICE.

The "Sight Feed" is owned exclusively by this company. See Judge Lowell's decision in the United States Circuit Court, District of Massachusetts, Feb. 23, '82.

All parties are hereby notified to desist the use, manufacture, or sale of same, as we shall vigorously pursue and prosecute all infringers.

MACHINERY FOR REDUCING AND POINTING WIRE
by compression or swaging **COLD.** Machines manufactured under patents owned by Miller, Metcalf & Parkin, Pittsburgh, Pa. For machines or information, address
S. W. GOODYEAR,
WATERBURY, CONN.

THE LOWE PATENT
Feed Water Heater & Purifier,
FOR
Heating and Purifying Water for Steam Boilers.
Patented July 12, 1877.
HAS STRAIGHT TUBES.
SIMPLICITY,
RELIABILITY
AND
EFFICIENCY,
At Less Cost
Than any other.



Write for prices and further information to the manufacturers,
Lowe & Watson.
BRIDGEPORT, CONN.

IRON WORKING MACHINERY
FOR IMMEDIATE DELIVERY.

19in. Lathes, Various Lengths,
22 in. x 22 in. Planers, 5 & 6 ft. Beds.

A. M. POWELL & CO.,
WORCESTER, MASS.

PECK'S PAT. DROP PRESS.
BLAST FORGES.
STEEL & IRON DROP FORGINGS
Drop Dies and Special Machinery.
BEECHER & PECK, NEW HAVEN CONN.

SCHUTTE & GOEHRING, Manufacturers of

KORTING'S DOUBLE TUBE INJECTOR.
OVER 30,000 IN USE.
THE LEADING BOILER FEEDER.
OPERATED BY ONE HANDLE.
WORKING UNDER ALL CONDITIONS.
WILL LIFT HOT WATER. POSITIVE IN ITS ACTION.

SEND FOR CIRCULAR.

OFFICES AND WAREROOMS:

12th and Thompson Street, Philadelphia.
A. F. UPTON, 7 Oliver St., Boston.
POND ENGINEERING CO., 709 Market St., St. Louis
C. F. KENNEDY, 194 15th St., Denver, Col.
G. B. LOMBARD & CO., 1026 Fenwick St., Augusta, Ga.
A. ALLER, 109 Liberty St., New York.
M. C. BULLOCK MFG. CO., 84 Market St., Chicago.
GEORGE A. SMITH, 1419 Main St., Richmond, Va.
H. P. GREGORY & CO., 2 California St., San Fran'co

Morse Twist Drill and Machine Company,

NEW BEDFORD, MASS., Sole Manufacturers of

MORSE PATENT STRAIGHT-LIP INCREASE TWIST DRILL

SOLID AND SHELL REAMERS, BEACH'S PATENT SELF-CENTERING CHUCK, BIT STOCK DRILLS,
Drills for Coes, Worcester, Hunter, and other Hand Drill Presses. Drill Grinding Machines, Center and Adjustable Drill Chucks, Taper Reamers, Milling Cutters, and Special Tools to order.

All Tools Exact to Whitworth Standard Gauges.

GEO. R. STETSON, Sup't. EDWARD S. TABER, Pres't and Treas.

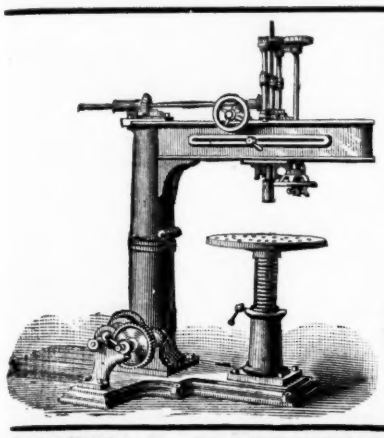
A fire-proof non-conductor and deafener. 24 cents per cubic ft. at wholesale prices. Sample and circulars free by mail.

MINERAL WOOL.

Fibre Magnified. X300

U. S. Mineral Wool Co.

22 Cortlandt Street, N. Y.



IMPROVED RADIAL DRILL

MANUFACTURED BY

HILLES & JONES,

WILMINGTON, DEL.

For Fitting up Steam Engine Cylinders, Steam Chests, Bed Plates, &c.

The radiating-arm traverses freely in all directions, carrying drill, spindle and gearing backward and forward by rack and pinion and hand wheels. The arm can be placed in any position, radiating from column as a center, enabling a large number of holes to be drilled in succession on the same surface without moving the work. Each machine is double back-geared, with automatic feed motion. Extension base plate is planed off true and slotted. **Four** sizes.

JOSEPH B. MATTHEWS, 41 Center Market Space, Baltimore, Md.

Manufacturer of the MATTHEWS

AUTOMATIC HIGH-SPEED ENGINE,

For Electric Lights and other purposes requiring steady, reliable power. The best and cheapest in the market. 25 H. P. for $500. Send for Circular.

UNIVERSAL

PATENT FURNACE,

SAVES FUEL AND INCREASES BOILER CAPACITY.

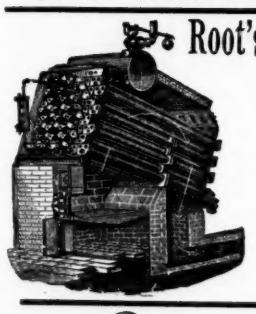
CORRUGATED GRATE BARS,

Suitable for Furnace Coal, Screenings, and all kinds of Waste Fuel.

JAMES MAHONY, 73 Astor House, New York.

FRICTION CLUTCH PULLEYS AND CUT-OFF COUPLINGS,

JAS. HUNTER & SON, North Adams, Mass.



Root's Wrought Iron Sectional Safety Steam Boiler.

ABSOLUTELY SAFE FROM EXPLOSIONS.

Unequaled in Economy of Fuel and Rapid Generation of Dry Steam.

All parts interchangeable. Easily erected in places inaccessible to other boilers. Altered or enlarged by any ordinary machinist. Shipped in packages weighing under 150 lbs. each. Low in price and first-class in material and workmanship.

OVER 260,000 H. P. IN USE FOR ALL PURPOSES.

Catalogues and **Conclusive References** mailed to any address. Drawings and full instructions for erection furnished with each boiler, making errors impossible.

ABENDROTH & ROOT MFG. CO., 28 Cliff Street, New York.

AGENTS..... { ALEX. E. BROWN, 130 Water Street, Cleveland, Ohio. GEO. J. ROBERTS & CO., Dayton, Ohio.

REFERENCE DIRECTORY

Containing the address of Manufacturers, Importers, Wholesale and Retail Dealers, Commission Merchants, etc., in **Iron, Steel, Hardware, Machinery of all kinds, Brass Goods, Metals, Tools, Agricultural Implements, Plumbing, Steam and Gas Fitting, Carriage and Saddlery, Hardware and Wood-Work, Stoves, etc. Artisans in all the Baser Metals, and all goods manufactured from them,**

Throughout the United States and British Provinces.

A valuable book to the above and kindred trades. It will be a large quarto and contain about 400 pages. Subscription Price, Five Dollars and name inserted in capitals. Send for Circular giving particulars.

ANDREW BOYD, Wieting Block, Syracuse, N. Y.

Publisher of New York State, Pennsylvania, and other Directories.

TRADE MARK.

UPRIGHT DRILL PRESS $75.00
KEY SEATING MACHINE $55.00
SEND FOR CATALOGUE TO
W. P. DAVIS
NORTH BLOOMFIELD, ONT. CO. N.Y.

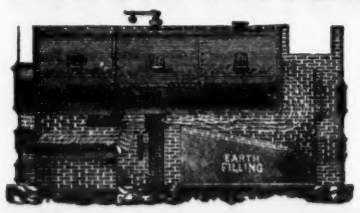
DEAN BROS'
STEAM PUMP WORKS,
INDIANAPOLIS, IND.

Boiler Feeders, Fire Pumps, Pumping Machinery for all purposes.

Send for Catalog

THOS. DANIEL,
PATTERN MAKER
60 FULTON ST., NEW YORK.
Electrical and Intricate Core Work a Specialty.

JARVIS PATENT FURNACE FOR SETTING STEAM BOILERS.



Economy of Fuel, with increased capacity of steam power. The same principle as the SIEMANS' PROCESS OF MAKING STEEL, utilizes the waste gases with hot air on top of the fire. Will burn all kinds of Waste Fuel without a blast, including screenings, wet peat, wet hops, sawdust, logwood chips, slack coal, &c.

A. F. UPTON, General Agent,

Send for circular. 7 Oliver St. (P. O. Box 3401,) Boston, Mass.

BERTON & NICKEL, New York Agents, No. 92 Liberty Street.

POND ENGINEERING CO., Western Agents, 709 Market Street, St. Louis, And 130 W. Second St., Cincinnati, Ohio.

D. SAUNDERS' SONS Yonkers, N. Y.

Manufacturers of

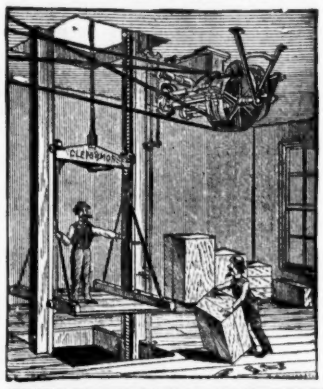
Steam and Gas Fitters' Hand Tools.

Send for Circular.

Pipe Cutting, THREADING And Tapping Machines,

THE PATENT WHEEL PIPE-CUTTER shown in the cut combines simplicity with strength and lightness. Easily adapted to various sizes of pipe. Rolling instead of sliding motion. No loose parts to become detached and mislaid. All wearing surfaces are of tool steel, hardened. Less friction of parts than any other pipe cutter made.

CLEM & MORSE,

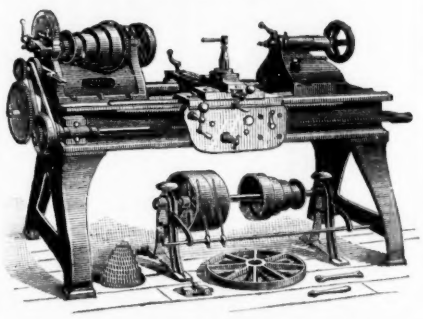


413 Cherry Street, Philadelphia.

108 Liberty Street, New York.

Send for descriptive circulars.

E. W. BLISS, BROOKLYN, N. Y.



Presses, Dies AND Special Machinery,

FINE ENGINE LATHES AND SHAPERS,

Foot and Power Squaring Shears.

---

20 INCH SWING ENGINE LATHES.

F. C. & A. E. ROWLAND, New Haven, Conn.

Pond Engineering Company,

Engineers & Contractors

of Steam and Hydraulic Machinery,

709 Market Street, St. Louis, Mo.

130 W. 2d St., Cincinnati, O. 88 Market St., Chicago, Ill.

Send for Circular.

Patent Lathe Chucks, Best & Cheapest

Hold from 1 in. to 20 ft. diam. In use 14 years, and good for 20, on roughest, dirtiest work.

Sent on trial by

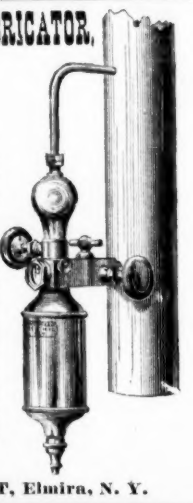
American Twist Drill Co.,

MEREDITH, N. H., Sole Manufacturers.

SWIFT'S AUTOMATIC LUBRICATOR.

MOST SIMPLE LUBRICATOR IN THE MARKET.

Contains no pipes inside, or glass tubes or pipes outside, to be disarranged or broken. Has a positive flash feed seen in a good light a distance of fifty feet. Body in one piece. All joints of metal, tested at a pressure of 160 pounds before leaving the works. Range of feed, from one drop in three minutes to one drop per second. All worn parts can be renewed at very slight expense. Will use dark or light oil. With ordinary care never fails to operate. Best of materials and best of workmanship. No leaky cocks. Invented by an engineer of twenty years' experience.



Made by

ALLEN W. SWIFT, Elmira, N. Y.

D. H. TUTTLE, 21 BEEKMAN ST NEW YORK — Engraver on Wood — MECHANICAL WORK A SPECIALTY

THE BARAGWANATH

S. J. F. W. H. & P.

Manufactured by the

Pacific Boiler Works

OF CHICAGO,

Has received unparalleled success in the West during the past five years. The most distinguished feature about this heater is its steam jacket, thus enabling it to accomplish the unprecedented result of almost invariably delivering the feed water several degrees above the boiling point, reducing back pressure on the engine, and keeping the boilers reasonably clean.

BENJ. F. KELLEY,

20 CORTLANDT ST., NEW YORK.

Gen. Eastern Agent.

FOUND

THE STEAM PUMPS

made by Valley Machine Co., Easthampton, Mass., are the best in the world for Boiler Feeding and other purposes.

FRANK THOMPSON,

Monitor, Hand, Speed and Back Geared

LATHES.

Slide Rests, Chucks and Brass Finishers Tools of the finest quality.

168 CENTRE STREET, N. Y. CITY.

W. H. WARREN, WORCESTER, MASS.

Manufacturer of

12 Inch Stroke Traverse Head Shapers,

and Five Foot Radial Drills, as specialties.

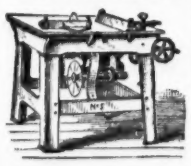
Extracts from Chordal's Letters.

One of the most interesting books for manufacturers, mechanics or business men, ever published. Just the thing for a Holiday gift. A great variety of mechanical and business topics treated in a wise and witty way that will be instructive to old and young, and interesting to everybody. The book contains 320 pages, 12mo, and over 40 Humorous Illustrations. Price, $1.50 per copy; by mail to any address. Published by

American Machinist Publishing Company,

96 Fulton Street, New York.

Wardwell's Patent Saw Bench,



Band Saws, Rotary and Stationary Bed Planers, and Buzz Planers, Jig Saws, Variety Moulding Machines, Pattern Makers' Lathe, Boring Machines, Dowel Machines, Waymoth Lathes, Gauge Lathes.

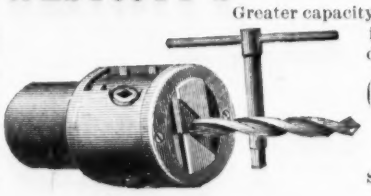
Also, a large stock of Second hand Machinery, consisting of Machinists' Tools, Woodworking Machinery and Engines and Boilers. Send for Illustrated Catalogue with stamp.

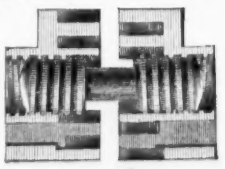
ROLLSTONE MACHINE CO., 45 Water St., Fitchburg, Mass.

WESTCOTT'S Combination Lathe CHUCKS,

Both Scroll and Geared.

Greater capacity. Jaws re-versible. No projecting screws in the rim. Movements independent, universal and eccentric.





Oneida Steam Engine & Foundry Co.

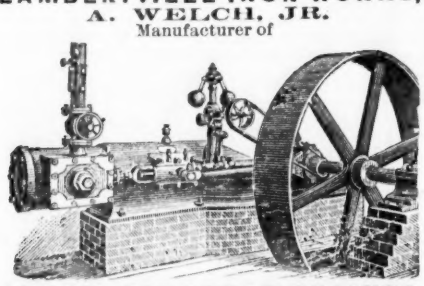
ONEIDA, N. Y.

Send for circulars.

KENSINGTON ENGINE WORKS, (Limited,)
Vienna and Beach Sts., - - - PHILADELPHIA,
ENGINEERS and MACHINISTS,
MANUFACTURERS OF BUCKEYE AUTOMATIC ENGINES
For Middle and South Atlantic States,
SPECIAL MACHINERY BUILT TO ORDER.
H. C. FRANCIS, Manager. JOHN T. BOYD, Engineer, WM. L. SIMPSON, Supt.

CLEVELAND TWIST DRILL COMPANY, COX & PRENTISS, 24 & 26 West St., Cleveland, O.

LAMBERTVILLE IRON WORKS,
A. WELCH, JR.
Manufacturer of



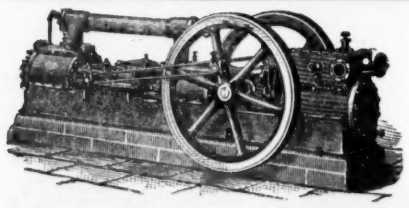
AUTOMATIC STEAM ENGINES,
Also, Plain Slide Valve Engines.
Send for Circular. LAMBERTVILLE, NEW JERSEY.

"THE NATIONAL CHUCK"

WARRANTED SUPERIOR TO ANY CHUCK IN THE MARKET
NATIONAL M'F'G CO. NEW HAVEN, CONN

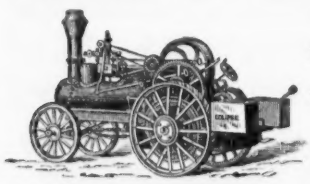
NUT TAPPING MACHINE.
DURRELL'S PATENT.
No. 1 Machine, 900 lb., 7 spindles.
" 2 " 1,050 " 7 "
" 2 " 600 " 3 "
Capacity of 7 Spindles, 8,000 per 10 hours.
Acknowledged to be an indispensable tool. Manufactured by
HOWARD BROS., Fredonia, N. Y.

Hand Paper Holder.
Adapted to hold one to four issues of the AMERICAN MACHINIST, for office or library use. A convenience that will be appreciated by many readers. Price by mail, prepaid, 75 cents.
American Machinist Publishing Co., 96 Fulton st., N. Y.



STEAM PUMPS, AIR COMPRESSORS, Friction Hoisting Engines, Vacuum Pumps and Condensers, General Machinery, Steam Engines. Capacity to bore cylinders 110 in. diameter and turn Fly Wheels of 24 feet.
The Norwalk Iron Works Co.
SOUTH NORWALK, CONN.

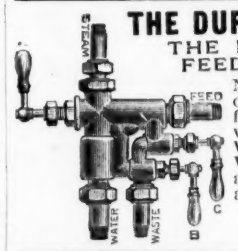
ECLIPSE PORTABLE & TRACTION ENGINES



Stationary Engines.
Iron and Steel Boilers.
Portable Circular Saw Mills.
Threshers & Separators.
Send for Catalogue and say where you saw this.
FRICK & CO.
Waynesboro, Franklin Co., Pa.

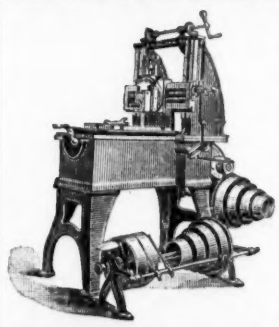
F. W. MOSS,
80 JOHN ST., N. Y.
STEEL AND FILES,
HAMMERS.
Warranted Cast Steel, for Dies, Punches, Drills, Turning Tools, Taps, Reamers, &c.
IMP'D MILD-CENTRED CAST STEEL
For Taps, Reamers, &c.

H. BICKFORD,
Manufacturer of
Drills
AN EXCLUSIVE SPECIALTY.
N. W. Corner Pike and Front Sts.
CINCINNATI, O.



THE DUPLEX INJECTOR,
THE BEST BOILER FEEDER KNOWN.
Not liable to get out of order. Will lift water 25 feet. Always delivers water *hot* to the boiler. Will start when it is hot. Will feed water through a heater. Manufactured and for sale by
JAMES JENKS, Detroit, Mich

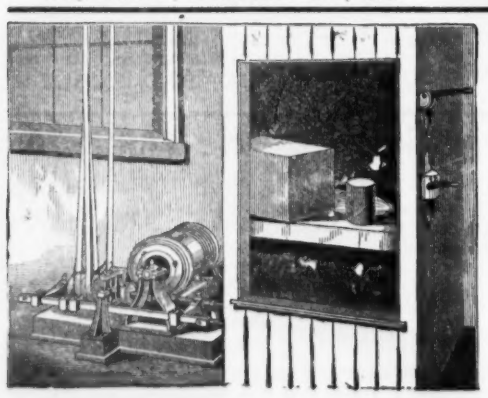
IMPROVED CRANK PLANER



Planes 16 inches high and wide, and has 12 inch stroke.
It has power, cross and angular down feed as shown in cut, or cross feed only, if desired.
Also, quick return motion and screw running whole length under bed.
It is self-oiling in its ways.
R. A. BELDEN & CO.
Danbury, Conn.

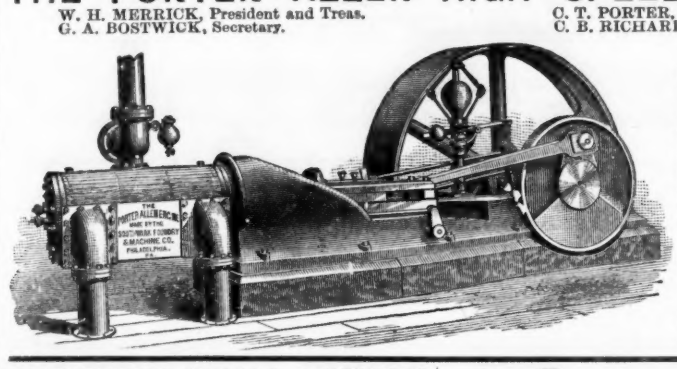
BULKLEY CONDENSER,

For every class of Steam Engines, Steam Pumps, Vacuum Pans, &c.
Guaranteed to Save 20 to 25 per cent. of fuel, or gain 25 to 30 per cent. in power.
Send for pamphlets, prices, references, &c.
HENRY W. BULKLEY,
149 BROADWAY, N. Y.



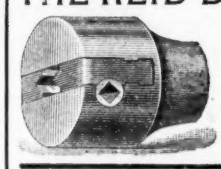
Tewksbury Automatic Elevator Co.
MANUFACTURERS OF
PACKAGE AND LIGHT FREIGHT
ELEVATORS
60 Temple Court, Beekman Street,
Send for Circulars. NEW YORK.

THE PORTER-ALLEN HIGH SPEED ENGINE.
W. H. MERRICK, President and Treas. C. T. PORTER, Vice-President.
G. A. BOSTWICK, Secretary. C. B. RICHARDS, Superintendent.



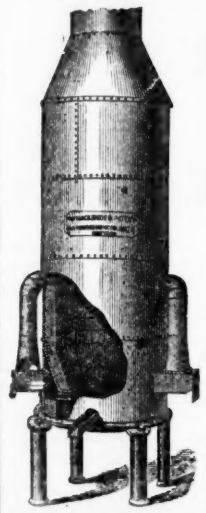
THE SOUTHWARK FOUNDRY & MACHINE CO., Philada., having largely increased its facilities is now prepared to fill all orders for the Porter-Allen Engine on contract time.
Orders solicited for Iron and Brass Castings in the rough.
Address the Company, 430 Washington Avenue, Phila., Pa.

THE REID DRILL CHUCK



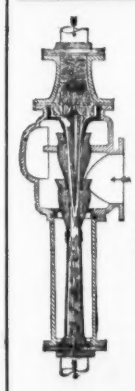
The Strongest, most Simple and greatest capacity of any in the market. Sold by all first-class Machinists' Supply Stores. Manufactured by
CHAS. H. REID, DANBURY, CONN.

W. C. YOUNG & CO., Worcester, Mass.
Manufacturers of
ENGINE LATHES, HAND LATHES,
Foot Power Lathes, Slide Rests, &c.



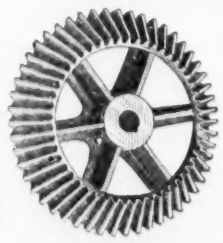
THE MACKENZIE CUPOLA
MADE BY
Smith & Sayre Mfg. Co.
245 BROADWAY, NEW YORK,
Differs from all others in having a continuous tuyere. Blast enters fuel at all points, causing complete diffusion of air, and uniform temperature throughout the furnace. Melts 10 to 15 tons an hour with blast pressure required to melt 2 or 3 tons in an ordinary cupola.
Gains largely in time, fuel and quality of casting.

"The Only Perfect"
BUFFALO PORTABLE FORGES.
The Lightest, Strongest, most durable, easiest working, and in every way
The Best Portable Forge Made.
BUFFALO FORGE CO.
Buffalo, N. Y.



SCHUTTE & COEHRING,
Manuf's of
KORTING CONDENSER.
For Steam Engines and Pumps.
Requires no Air Pump and no foundations. Only 15 ft. height of water required from level of water supply to discharge pipe, instead of 34 ft., whether above or below engine cylinder. Has fewer parts, and is lower in price than any other condenser. Send for circular giving full information.
Offices and Warerooms:
12th and Thompson Sts., Philadelphia.
A. ALLER, 109 Liberty St., New York.
A. F. UPTON, 7 Oliver St., Boston.

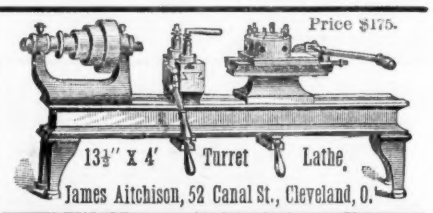
MACHINE MOULDED GEARING,
SHAFTING, PULLEYS, Etc.
In great variety of sizes. Castings or finished work furnished the trade at favorable prices.



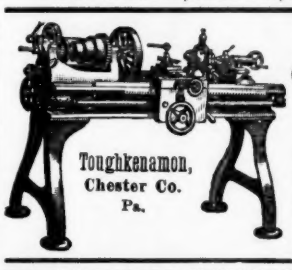
ALSO,
LEFFEL TURBINE
Water Wheels.
POOLE & HUNT,
BALTIMORE, Md.

VOLNEY W. MASON & CO.
Friction Pulleys, Clutches and Elevators,
PROVIDENCE, R. I.

Price $175.



13½" x 4' Turret Lathe,
James Aitchison, 52 Canal St., Cleveland, O.



Toughkenamon, Chester Co. Pa.
W. & A. ASHTON HAND, MAKER OF FIRST-CLASS Engine Lathes

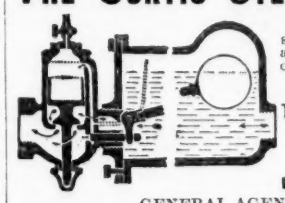
THE KEYSTONE INJECTOR

SIMPLEST & BEST, BOILER FEEDER
MANF'CD BY
E. TRACY
511 & 513 N^TH 12^TH ST,
PHILADELPHIA PA.
SEND FOR CIRCULAR.

THE BRAYTON PETROLEUM ENGINE CO.
50 Federal St.
BOSTON, MASS.

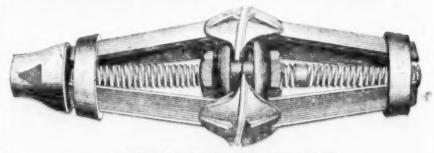
No Boiler. No Coal. No Steam. No Ashes. No extra Insurance. No Engineer. No Danger. No Explosion. No Fires. Almost no Attendance.
SAFETY! ECONOMY! CONVENIENCE!
Expense Ceases when Engine is Stopped.
When power is required at intervals it is the cheapest Motor known.

THE CURTIS STEAM TRAP.



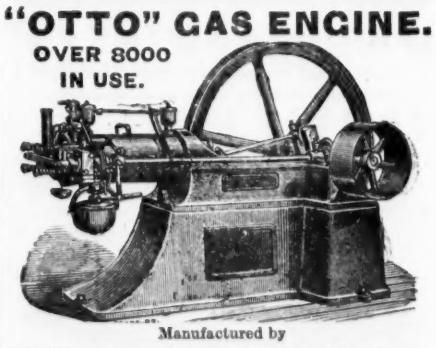
Send for Circular stating advantages and superiority over other traps.
Manufactured by
THE CURTIS REGULATOR CO.
51 Beverly St.
BOSTON, MASS.
GENERAL AGENTS:
A. ALLER, New York, 109 Liberty St.
JOHN McKAY, JR., Philada., 135 North 3d St.
EDW'D J. MOORE, Baltimore, 8 South St.

E. G. FELTHOUSEN, BUFFALO, N. Y.
Manufacturer of
Patent Flue Scrapers
Ratchet Drills, Gauge Cocks, Cylinder Oil Pumps, &c.



CONSTRUCTION SIMPLE.
Best and Cheapest Flue Scraper made.
C. M. MORSE, Eastern Agent,
Office, 152 NASSAU ST., NEW YORK.

"OTTO" GAS ENGINE.
OVER 8000 IN USE.



Manufactured by
SCHLEICHER, SCHUMM & CO., 33d & Walnut Sts., Philada.

THE HARTFORD AUTOMATIC CUT-OFF ENGINE.

Built for Heavy and Continuous Work, and adapted to any required speed

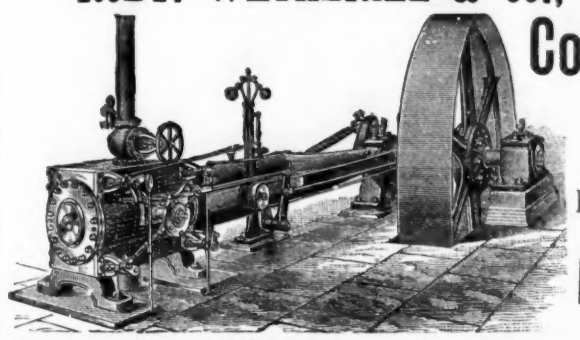
Close regulation and best attainable Economy of Fuel. Circular and Practical Treatise on Steam Engineering sent on application.

The Hartford Engineering Company,
HARTFORD, CONN.

New York Office,
Rooms 72 and 73 Astor House.

Hill, Clarke & Co., Agents,
36 Oliver St., Boston.

ROBT. WETHERILL & CO., CHESTER, PA.



Corliss Engine Builders,

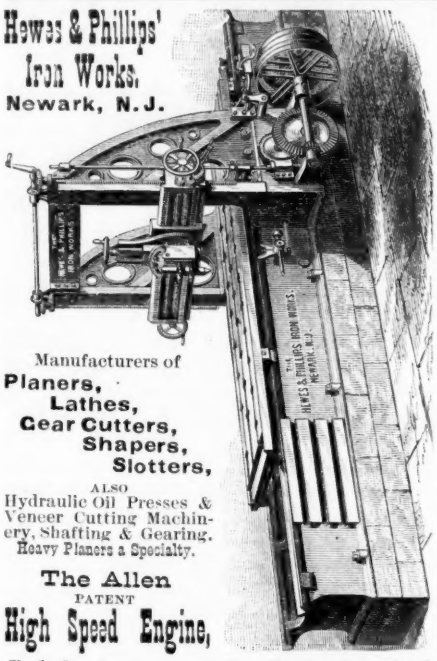
Condensing, Non-condensing, and Compound.

HIGHEST EFFICIENCY AND GREATEST ECONOMY.

Boiler Makers.

Hydraulic Riveting.

Hewes & Phillips' Iron Works.
Newark, N.J.



Manufacturers of
Planers,
Lathes,
Gear Cutters,
Shapers,
Slotters,

ALSO
Hydraulic Oil Presses & Veneer Cutting Machinery, Shafting & Gearing. Heavy Planers a Specialty.

The Allen PATENT
High Speed Engine,

Both Condensing and Non-Condensing. High economic duty and fine regulation guaranteed Tubular Boilers and Steam Fittings.

New & Second-Hand ENGINES, BOILERS,
Steam Pumps and Boiler Feeders,

MACHINERY, TOOLS & SUPPLIES
For Iron and Wood Workers.

Foot and Hand Power Machinery. Machinists' Hand Tools, &c., &c.

O. L. PACKARD,
85 & 87 WEST WATER STREET,
MILWAUKEE, WIS.

CORLISS ENGINES FOR SALE.
PROMPT DELIVERY.

One 12 inch Cylinder.	36 inch Stroke.	At once.
One 14 "	36 "	In two weeks.

APPLY TO
THE GEORGE PLACE MACHINERY CO.
121 Chambers & 103 Reade Sts., New York.

FOR SALE.

4 New Cylinder Boilers 36" diam. x 30' long each, with fittings and fixtures complete, including 1 Steam Drum 24" diam. x 13' long; 1 Mud Drum 20" diam. x 16' 6" long.

ALSO,

3 New Stationary 2 Flue Boilers, 42" diam. x 30' long, Flues 14" diam., with complete fixtures and fittings, including 1 Steam Drum 24" diam. x 12' long. Breeching, Stack, Etc.

Full Specifications, with drawings, will be furnished upon application.

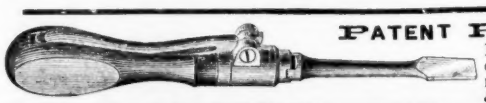
Stearns' M'f'g Company,
ERIE, Penna.

BIRKENHEAD'S NEW SINGLE HEAD LATHES

Hollow Spindle, Improved Stop Motion, 14 in. Swing 4 to 8 feet beds.
Send for Circular.

JOHN BIRKENHEAD,
MANSFIELD, MASS.,
U. S. A.

PATENT RATCHET SCREW-DRIVER.



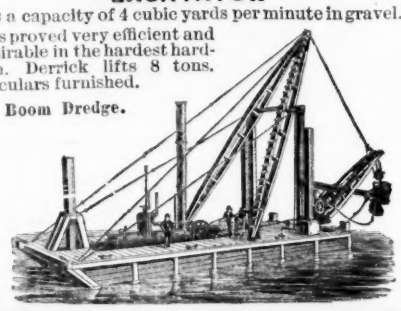
Price per set, one handle and three blades, drop forged tool steel, $3.00 All goods warranted. Send for Circular. Address: Rhodes & Hays, P. O. Box 25, Hartford, Conn.

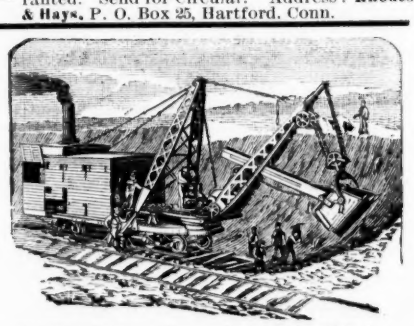
DREDGES
guaranteed to excavate 50 per cent. more material from hard bottom than any other machine.

EXCAVATOR
has a capacity of 4 cubic yards per minute in gravel.

Has proved very efficient and desirable in the hardest hard-pan. Derrick lifts 8 tons. Circulars furnished.

Boom Dredge.



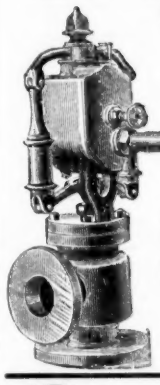


Combined Steam Excavator and Derrick Car.

OSGOOD & MACNAUGHTON,
ALBANY, N. Y., Patentees,
Successors to RALPH R. OSGOOD, Troy, N. Y.

Fox, Turret and Speed Lathes
—AND—
Swivel Head Engine Lathes,
(18 and 26 in. from new patterns)
GEORGE GAGE, WATERFORD, N. Y.

CRAIG'S HYDRAULIC GOVERNOR,
FOR STEAM ENGINES,
The Most Perfect Governor Known.

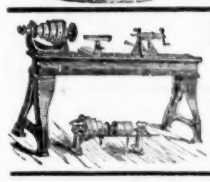


RUNS IN OIL.

Guaranteed to accurately regulate all classes of engines.

Illustrated and descriptive Catalogue sent on application. Correspondence solicited.

W. H. CRAIG & CO.
Sole Manufacturers,
LAWRENCE, MASS.



Extra Heavy 16 inch
HAND LATHES.
Built by FAY & SCOTT, Machine Tool Builders.
DEXTER, Me.
Send for description.

New & Second-Hand Machinery.
DEC. 7, 1882.

1	Engine Lathe,	14 in. x 5, 6 & 7 ft.	Grant & Bogert.
1	" "	26 in. x 12 ft.	Grant & Bogert. [New.
1	" "	22 in. x 14 ft.	" " New.
1	" "	36 in. x 12, 17 ft.	New.
1	" "	42 in. x 14 ft.	New.
1	" "	32 in. x 8 ft.	" "
1	" "	21 in. x 7 ft.	" " Pond.
1	" "	14 in. x 6 ft.	Star Tool Co. New.
1	" "	15 in. x 6 ft.	"
1	" "	14 in. x 5 x 6 ft.	"
1	" "	16 in. x 6, 7 & 8 ft.	Bridgeport. "
1	" "	13 in. x 5 ft & 6 ft.	Ames. "
1	" "	16 in. x6, 7 & 8 ft.	Ames. "
1	" "	18 in. x8 & 10 ft.	Lodge & Barker"
1	" "	27 in. x 10 in.	Lodge & Barker.
1	" "	22 in. x 12 ft.	Fifield "
1	" "	20 in. x 10 ft.	Fifield. New.
1	" "	28 in. x 16 ft.	New. Fifield.
1	" "	11 in. x 4 ft. & 5 ft.	Prentiss. New.
1	" "	11 in. x 4 ft.	New.
1	" "	12 in. x 5 ft.	Young. New.
1	Plain Engine Lathe,	16 in. x 4 ft.	"
1	" " "	15 in. x 4 ft.	New.
1	Fox Lathe, 15 in. x 5 ft.		Am. Tool & Machine Co.
1	15 in. x 4 ft. Turret Lathe.		Lodge & Barker.
1	Fox Turret Lathe, 16 in. x 6 ft.		Lodge & Barker. New.
1	Planer, 38 in. x 38 in. x 13 ft.		New.
1	" 16 in. x 14 in. x 3½ ft.		New.
1	" 22 in. x 20 in. x 5 ft.		"
1	" 24 in. x 24 in. x 6 ft.		Hendey. new
1	" 26 in. x 26 in. x 7 ft.		
1	" 16 in. Lever Table Drill.		New.
1	16 in. Upright Drill.		" "
1	20 in. Upright Drill.		Prentiss. "
1	24 in. " "		Prentiss. "
1	30 in. " "		" "
1	25 in. swing B.G. & S.F. Drill.		Blaisdell. "
1	28 in. " "	" "	" "
1	15 in. Shaper.		Gould & Eberhardt. "
1	10 in Shaper.		Gould & Eberhardt. New.
1	15 in. Shaper.		Hendey. "
1	24 in. Shaper.		Hendey. "
1	9 in. Shaper		Hewes & Phillips. "
1	9 in. Shaper.		New.

Full assortment Milling Machines, Spindle Drills, &c., of Garvin's. New.

1	Schlenker Bolt Cutter to take sizes from ¼ to 1¼ inches inclusive.	New
2	No. 2 Lincoln Millers.	Good order
½	No. 2 Lincoln Miller.	New.
1	Hand Lathe, 12 x 4, 5 and 6 ft.	New.
1	Hand Lathe, 16 in. x 6 and 7 ft.	New.
1	Upright Boring and Chucking Mill 31 in. swing.	A1 order.
1	Boring and Turning Mill, 50 in.	New.
1	200 lb. Steam Hammer.	Ferris & Miles. Good order
1	700 lb. " " " " "	" "

NEW YORK AGENCY OF THE TANITE CO., AND GRANT & BOGERT MACHINE TOOL WORKS.

H. PRENTISS & COMPANY, 42 DEY ST., N. Y.

New & Second-Hand MACHINERY.
Dec. 7, 1882.

The following New and Improved Machinists Tools are part of what we have for early delivery

1	60 in. swing	24 ft. bed.	Engine Lathe.	Dec. 1,
1	42 in. "	20 ft. "	" "	" 1.
1	36 in. "	18 ft. "	" "	" 15.
1	36 in. "	14 ft. "	" "	" 15.

The following on hand:

1	New Corliss Engine.	12" x 36".	Complete.	
1	42 in. swing,	16 ft. bed,	New Engine Lathe.	
1	30 in. "	18 ft. "	" "	"
1	30 in. "	16 ft. "	" "	"
1	30 in. "	14 ft. "	" "	"
1	22 in. "	12 ft. "	" "	"
4	18 in. "	8 ft. "	" "	"
5	15 in. "	6 ft. "	" "	"
1	10 in. "	5 ft. "	" "	"
1	30 in. "	12½ ft. "		
1	26 in. swing,	14 ft. bed.		
1	12 in. swing,	6 ft.	Hand Lathe. New.	
1	10 in. "	4½ ft.	Bed Hand Lathe. New.	
1	38 in. x 12 ft.	Iron Planer. New.		
1	38 in. x 10 ft.	" " "		
1	32 in. x 8 ft.	" " "		
1	26 in. x 6 ft.	" " "		
2	30 in. x 8 ft.	" Planers. "		
2	22 in. x 4 ft.	" " "		
2	38 in. Swing Upright Drills.	B. G. & S. F. New.		
1	23 in. Drill.	B. G. & S. F.	New.	
1	22 in. "	Upright Drill.	B. G. S. F.	New.
1	23 in. "	Plain.		
3	20 in. "	"		
1	18 in. Bench Drill.			
1	4 spindle Drill.	New.		
1	3 "	" "		
2	4 "	" Second-hand.		
1	12 in. stroke Slotting Machine.	New.		
2	12 in. Shapers.	New.		
2	15 in. "	"		
2	12 in. stroke Shapers, traveling head, 40 in. traverse double tables.	New.		
1	6 in. stroke Hand and Power Shaper, with Counter-shaft.			
3	Wood's Patent Bolt Cutting Machines to cut from ½ in to 2 in inclusive.	New.		
1	Seliers Milling Machine.	2d-hand.		
1	Face Milling Machine.	Second-hand.		
1	Pond's Double Milling Machine.	2d-hand.		
1	No. 1 Screw Machine.	Brown & Sharpe.	2d-hand	
1	Screw Head Slotter.	Second-hand.		
2	Second-hand Profiling Machines			
2	4½ in Hyde's Patent Centering Machines.	New.		
1	Emery Grinder, 2d-hand, for 10 in. Wheels.			
1	Bolt Pointing Machine.	Second-hand.		
1	Double Nut Tapper.	New Horizontal.		
2	Double-Acting Presses, No. 3,	nearly new.		
1	No. 00 Fowler Press.			
4	Single-Acting Presses, for power,	"		
90	Foot Presses,	nearly new.		
2	Small Power Punching Presses.	Second hand.		
1	Foot Punch, with bench.	New.		
1	Lot Pistol Machinery.	Second-hand.		

Lot of Forges 1 Railway Saw Bench, 1 Foot-power Circular Saw.

Cold Rolled Shafting, Pulleys, Hangers, Couplings, &c., always in stock.

The George Place Machinery Company
121 Chambers and 103 Reade Sts., New York.

New and Second-Hand Iron Working MACHINERY.

One	Engine Lathe,	42 in. x 16 ft.	Triple Geared.	Ames. New.
One	Engine Lathe,	36 in. x 18 ft.	Fifield,	New.
One	" "	28 in. x 16 ft.	Ames.	"
One	" "	30 in. x 14 ft.	"	"
Two	Engine Lathes, each 24 in. 8 ft. x 10 ft.-12 ft -14 ft. and 20 ft.			New. Ames.
Two	Engine Lathes, 24 in. x 10 & 12 ft.		Fifield.	
One	Engine Lathe, 20 in. x 12 ft.		Ames,	New.
One	" "	20 in. x 10 ft.	"	"
One	" "	20 in. x 8 ft.	"	"
One	" "	20 in. x 10 ft.	Jones & Lamson.	New.
One	Engine Lathe, 16 in. x 6-7-8-10-12 ft.		Bridgeport Mch. Tool Works.	New.
Six	Engine Lathes, 16 in. x 6 ft.-7ft. x 8 ft.		Ames.	New.
One	Engine Lathe, 14 in. x 6 ft.		Star Tool Co.	New.
Two	Engine Lathes, 13 in. x 5 ft.		Ames.	New.
Three	Hand Lathes. 12 in. x 5 ft.		Hendey.	New.
Two	Pulley Turning Machines, 26 in. & 36 in.			New.
One	Planer 16 in. x 3 ft.		Pratt & Whitney,	good order
Two	Planers, 20 in. x 4 ft.		Lathe & Morse Tool Co.	
One	Planer, 24 in. x 6 ft.-7 ft.-8 ft.		Ames.	New.
Two	Planers, 26 in. x 7 ft.		New.	
One	" 27 in. x 6-7-8 ft.		Ames.	New.
One	" 28 in. x 6 ft.		Gleason.	New.
One	6 in. Stroke Shaper.		Boynton.	New.
Two	9 in. Stroke Shapers.		Hewes & Phillips.	
One	15 in. Stroke Shaper.		Hendey.	New.
One	15 inch Stroke Shaper.		Gould & Eberhardt.	New.
One	24 in. Stroke Shaper.		Hendey.	New.
One	Screw Machine.	No. 2.	P. & W.	
One	Screw Machine.	No. 3.	P. & W.	
One	Screw Machine.	New Pattern.	Wire Feed.	Secor.
Three	4 Spindle Drills.	No. 2.	Pratt & Whitney.	
One	6 " "	No. 1.	" "	
One	20 in. Upright Drill.		Prentiss.	New.
One	22 in. Upright Drill.		Prentiss.	New.
One	26 in. Upright Drill.		Prentiss.	New.
One	30 in. Upright Drill.		Prentiss.	New.
Three	Sensitive Drills.			
13	Lincoln Millers and Vises.		Good order.	
Two	Lincoln Pattern Millers.		Pratt & Whitney.	Good
One	10 lb. Air Hammer.		Hotchkiss.	Good order,
One	200 lb. Bradley Hammer.		A1.	
One	60 lb. Bradley Hammer.		New.	

All sizes Bradley Hammers furnished to order promptly.

E. P. Bullard, 14 Dey Street, New York.

General Eastern Agent for
AKRON IRON CO'S Patent Hot Polished SHAFTING

MACHINERY.

90	inch Swing,	20 foot Bed,	Engine Lathe.	2d hand.
43	"	14 "	"	New
23	"	16 "	"	2d hand
22	"	8 "	"	"
21	"	6 "	"	"
20	"	8 "	"	"
20	"	6 "	"	"
19	"	7 "	"	"
18	"	7½ "	"	"
18	"	6 "	"	"
17	"	6 "	"	"
16	"	6 "	"	"
15	"	6 "	"	"
14	"	6 "	"	"

Large list of New Lathes. Various sizes and lengths.
50 inch x 50 inch x 16 foot Iron Planer. 2d hand.

36	"	36	"	9	"	"	"
56	"	56	"	16	"	"	" 2 heads. New.

Large list other sizes, new and second-hand.
Shapers, Drills, Bor'g Mills, Cutting-off Machines, &c.
Send for Circular of other tools.

J. M. BADGER, 5 Dey St., N. Y.

HILL, CLARKE & CO.
36 OLIVER ST., BOSTON, MASS.
Branch Office, 800 North Second Street, St. Louis, Mo.

Machinists' Power Tools & Supplies.

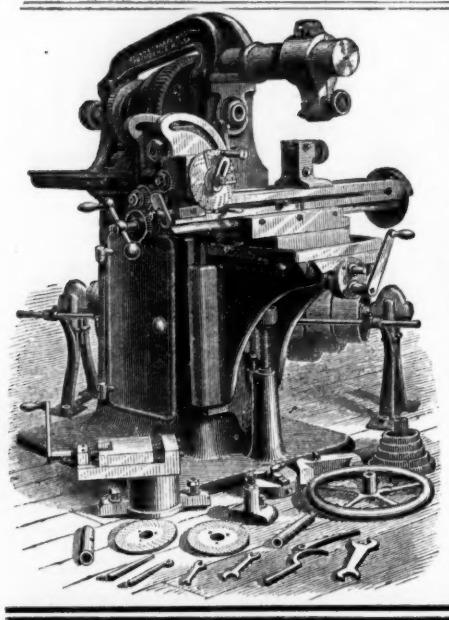
LIST OF LARGE LATHES ON HAND.

One Fitchburg, Triple Geared, Screw Cutting Engine Lathe, 50 inch swing, 20 foot bed.

One Special Shafting Lathe, 26 inch swing, 25½ foot bed, to take 20 feet between centers.

MACHINE TOOLS
now on exhibition at New England Manufacturers' and Mechanics' Institute,

Will be sold at very low prices
to save expense of removal.
Send for List and state what Tools you want.



BROWN & SHARPE MFG. CO.

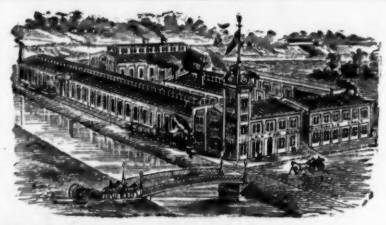
PROVIDENCE, R. I.

Manufacturers of the

Universal Milling Machine.

This machine has been designed especially to meet the wants of Steam Engine and Locomotive builders, and others engaged in the manufacture of heavy machinery and tools.

The essential features and motions are the same as in our smaller Universal Milling Machine, with such enlargement of the whole machine and its parts as would best adapt it for the class of work to be done. The cone has three diameters, each 3½ inches face. In addition, the cone is strongly geared, thus making six changes of speed. There are also the same number of changes of feed. The spindle boxes are of hardened cast steel and, together with the spindle bearings, are carefully ground, and are provided with means of compensation for wear. The spindle will carry a cutter arbor projecting 15 inches, which is supported by an adjustable center at the outer end. Cutters of 8 inches or less diameter can be used. The horizontal movement of the spiral clamp bed upon the knee, in a line with the spindle of the machine is 6½ inches, and the vertical movement of the spiral bed centers below the spindle centers is 11 inches. The spiral bed can be set at angles of 35° each way from center line of spindle, and can be fed automatically 22 inches, taking also 22 inches between the centers, and will swing 11½ inches. ☞ Illustrated Catalogue sent per mail on application.



MACHINE TOOLS

And Iron-Working Machinery of every description.

BORING AND TURNING MILLS,

Driving Wheel Lathes.

Hydrostatic Wheel Presses,
Car Axle Lathes,
Car Wheel Borers,
Screw Machines,
Universal Radial Drilling Machines.

Iron Planers,
Engine Lathes,
Upright Drill Presses.
Special Pulley Turning Lathes,
Special Pulley Boring Machines,
&c., &c., &c.

NILES TOOL WORKS, HAMILTON, OHIO.

Eastern Warerooms, 22 S. Sixth St., Philadelphia, Pa.

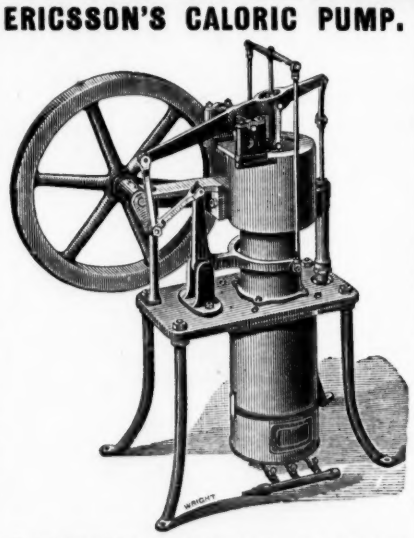
THE BUFFALO STEEL FOUNDRY, BUFFALO, N. Y.

PRATT & LETCHWORTH, Proprietors.

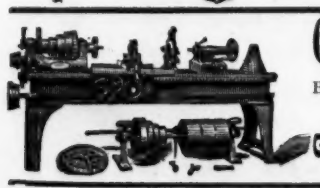
Orders and correspondence solicited.

GEO. W. FIFIELD,
Manufacturer of **ENGINE LATHES** from 16 to 48 in. swing. Cuts, Photographs and Prices furnished on application. **LOWELL, MASS., U. S. A.**

ERICSSON'S CALORIC PUMP.



C. H. DELAMATER & CO., 10 Cortlandt Street, New York.



GRAY'S PATENT 19 IN. LATHE.

Built to Standard Gauges and Templates, with Special Machinery.

EVERY MACHINE BELTED AND TESTED.

G. A. GRAY, Jr., & CO., 17 EAST 8TH STREET, CINCINNATI, O.

LODGE, BARKER & CO., CINCINNATI, OHIO,

Manufacturers of ENGINE AND TURRET LATHES.

We have for immediate delivery several Back Geared Turret Lathes, with dove-tail set over. Also 18 inch Screw-Cutting Engine Lathes.

Quick delivery for 26 in. Swing Screw-Cutting Engine Lathes of new and improved designs. Very powerful and very convenient for handling.

EX INUTILI TRADE TANITE MARK UTILITAS

Emery Wheels and Grinding Machines.

THE TANITE CO.

Stroudsburg, Monroe County, Pa.

Orders may be directed to us at any of the following addresses, at each of which we carry a stock:

NEW YORK, 42 DEY STREET.

Boston, High and Oliver Sts.
Philadelphia, 9 5 Market St.
Pittsburgh, 137 First Avenue.
Baltimore, 59 and 61 German St.
Indianapolis, 206 to 216 S. Illinois St.
Indianapolis, 184 & 186 E. Washington St.
Cincinnati, Cor. Pearl and Plum Sts.
Chicago, 152 & 154 Lake St.
Chicago, 40 Franklin St.
Minneapolis, 254 Second Avenue South.
St. Paul, 316 & 318 Robert St.
St. Louis, 209 N. Third St.
St. Louis, 811 to 819 N. Second St.
New Orleans, Union and St. Charles Sts.
San Francisco, 2 & 4 California St.
Portland, Oregon, 43 Front St.
Sidney, N. S. W., 17 Pitt St.
Liverpool, Eng., 42 The Temple, Dale St.

THE PRATT & WHITNEY CO., HARTFORD, CONN.

Have Ready for Delivery:

Drilling Machines—1, 42 in. table, automatic feed, back gears, quick return movement of spindle; No. 3 vertical, and No. 1, manufacturers; No. 0 gang drills, 3, 4 and 6 spindles; 1 14 in. Shaping Machine; 1 Horizontal Boring Mill, 14 ft. bed, 42 in. swing; 1, 10 in. Crank Shaper. Engine Lathes, 13 in. swing, 4, 5 and 6 ft. beds; 27 in. swing, 12 and 14 ft. beds; Hand Lathes, 12 and 15 in. swing, 5 and 6 ft. beds; Cutting-off Lathes for 2½ and 4 in. diameter. Revolving head Screw Machines, No. 1, No. 2, No. 3 and No. 4; Hand Milling Machines, No. 1; Bolt Cutters, turret head, No. 2, 3 and 4; National, No. 2, 3 and 4. No. 1, Screw Shaving Machines: No. 1 and No. 2 Screw Slotting Machines.

DROP FORGINGS

Of Every Description, from 1-16 ounce to 30 lbs. weight, for

Guns, Pistols, Sewing Machines, Machinists' Tools,

AND MACHINERY GENERALLY.

The Pioneers as a specialty in this line of business. Estimates given promptly on receipt of models Send for Catalogue and Descriptive Circular.

THE BILLINGS & SPENCER CO.

HARTFORD, CONN., U. S. A.

GRANT & BOGERT,

FLUSHING, L. I., N. Y.

MANUFACTURERS OF

14 in. & 26 in.

LATHES.

SPECIAL MACHINERY

Built to Order, and

TOOLS OF ALL KINDS,

Shop well furnished for good work.

S. McHENRY, 927 FILBERT STREET, PHILADELPHIA.

ROP HAMMERS

Punching Presses
DIES AND OTHER TOOLS
For the manufacture of all kinds of **SHEET METAL GOODS, DROP FORGINGS, &c.**
Stiles & Parker Press Co., Middletown, Conn.

MACHINISTS' TOOLS.

SECOND-HAND IN FIRST CLASS CONDITION FOR DELIVERY.

DECEMBER 6, 1882.

1 Engine Lathe, 15 in. x 6 ft. Flather & Co.
1 " " 14 in. x 6 ft. Hand.
1 " " 14 in. x 4½ ft. Putnam.
1 " " 24 in. x 12 ft. Pond.
1 Planer 22 in. x 22 in. x 5 ft. N. Y. St. Engine Co.
1 " 17 in. x 17 in. x 4 ft. Hendey.
1 " 16 in. x 16 in. x 3 ft. P. & W. Co.
1 22 in. Upright Drill Press. F. E. Reed.
1 6 H. P. Engine. Baxter.
1 Bolt Cutter to 1 in. Wiley & Russell Co.
1 Patent Adj. Power Press, No. 20. Bliss.
1 One-Spin. Edging Machine. Our Make.

Also Milling Machines, Gang Drills, Hand Lathes, &c., of our own make.

E. E. GARVIN & CO.,
139 & 143 CENTRE ST., N.Y.

ELECTRIC LIGHT APPARATUS,

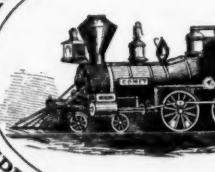
SPECIAL MACHINERY AND HARDWARE

Designed and built by day or contract. Have had five years experience building electric light apparatus. Facilities for making complete apparatus for 50 arc lights a day. Twenty years experience designing and building special and labor-saving machinery. Estimates given.

JAMES BRADY, (Suc'r to Brady Mf'g Co.)
257 & 259 Water St., Brooklyn, N. Y.

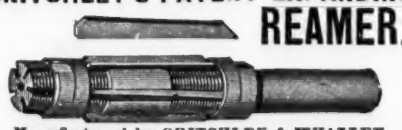
Engine Lathes, Planers, Drills, &c.
DAVID W. POND, Worcester, Mass.
Send for Catalogue of New Designs.

HARTFORD STEAM BOILER INSPECTION AND INSURANCE CO.



J. M. ALLEN, PRESIDENT.
W. B. FRANKLIN, VICE-PRESIDENT.
J. B. PIERCE, SECRETARY.

CRITCHLEY'S PATENT EXPANDING REAMER.



Manufactured by CRITCHLEY & WHALLEY, PORTSMOUTH, N. H.
Send for Circular.

THE BABCOCK & WILCOX CO.'S

WATER TUBE STEAM BOILERS.

BRANCH OFFICES:
Boston, 50 Oliver St.
Syracuse, Room 15, White Buildings.
Philadelphia, 32 N. 5th St.
Pittsburgh, 91 4th Ave.

NEW YORK: 30 CORTLANDT ST.
GLASGOW: 107 HOPE ST.

BRANCH OFFICES:
Baltimore, Room 45, Chamber Commerce Building.
Chicago, 48 So. Canal St.
New Orleans 60 Carondelet
San Fra'co, 505 Mission St.

MANUFACTURER OF **TAPS & DIES**